

JANUARY, 1934

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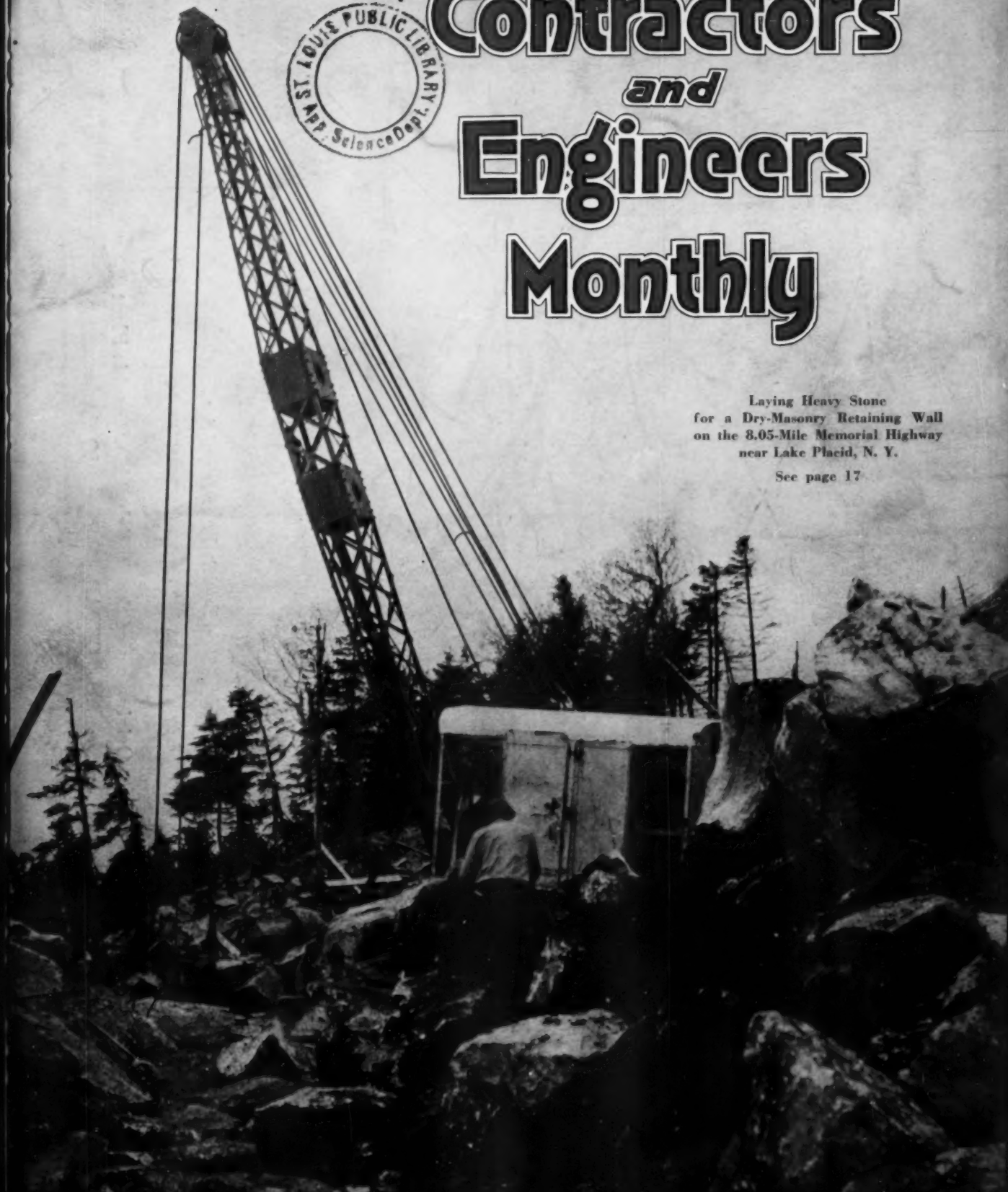
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Contractors *and* Engineers Monthly

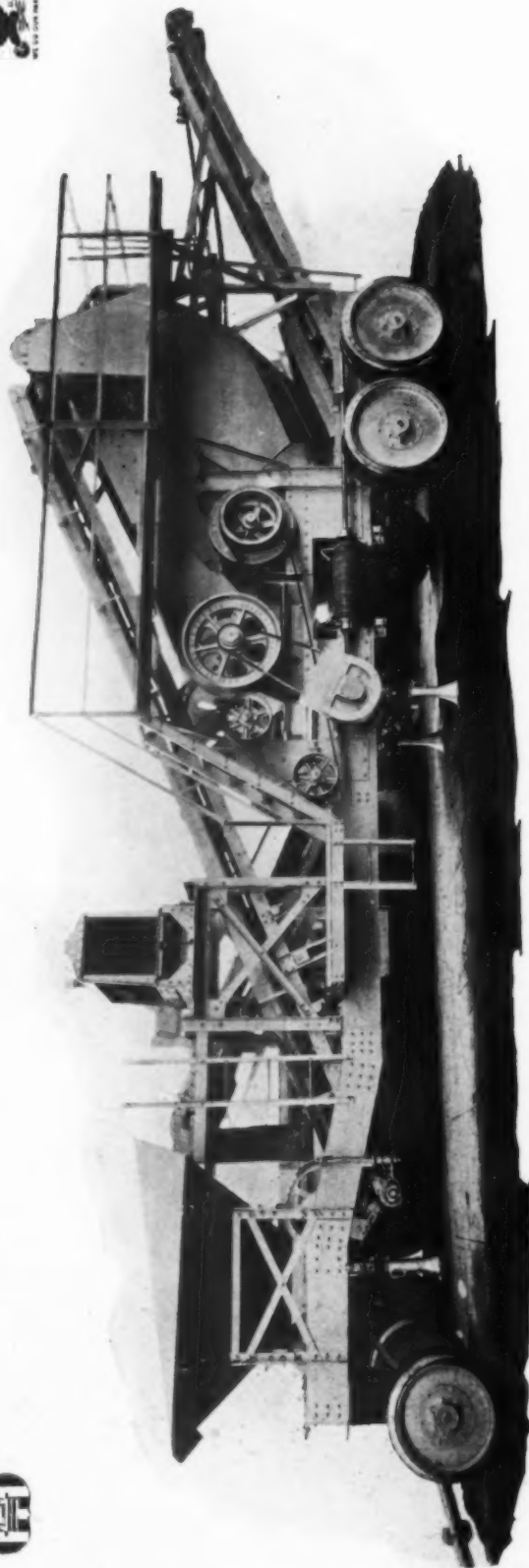
Laying Heavy Stone
for a Dry-Masonry Retaining Wall
on the 8.05-Mile Memorial Highway
near Lake Placid, N. Y.

See page 17



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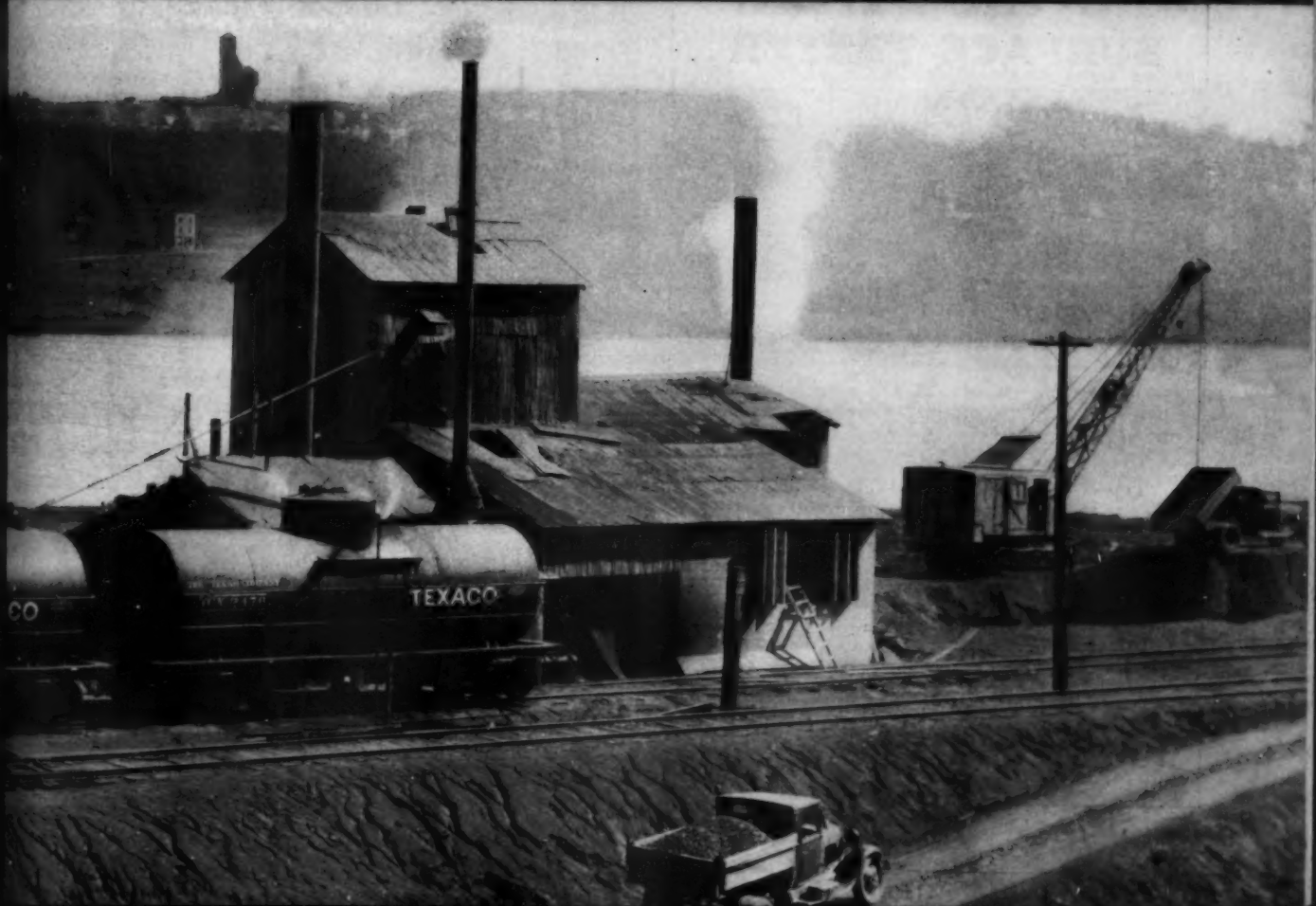
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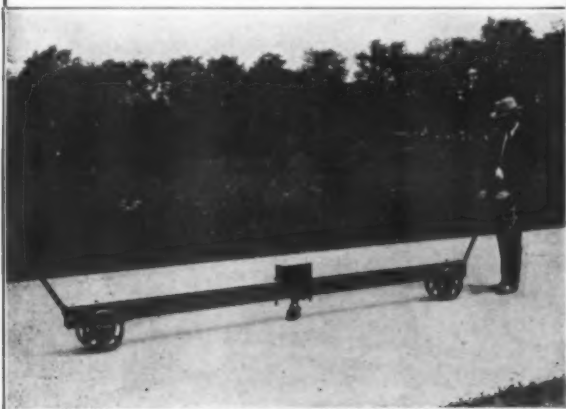


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Roller-bearing rubber-tired rear wheels make this machine easy to move, and a special air filter keeps dust from the working parts.

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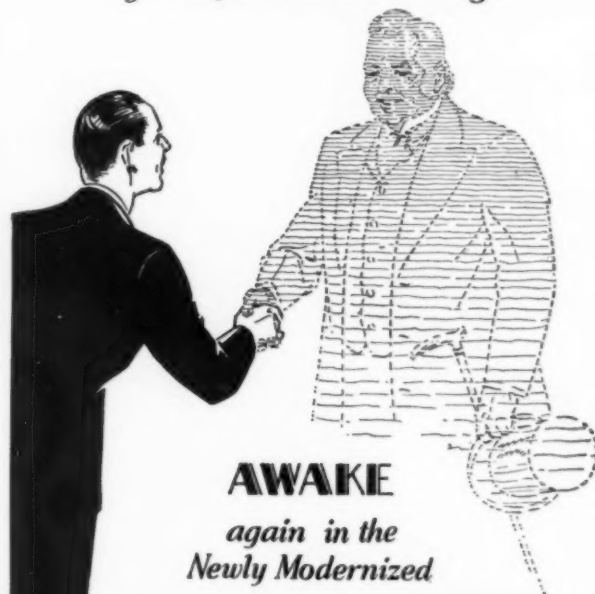
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ARTHUR J. NEWMAN, Manager

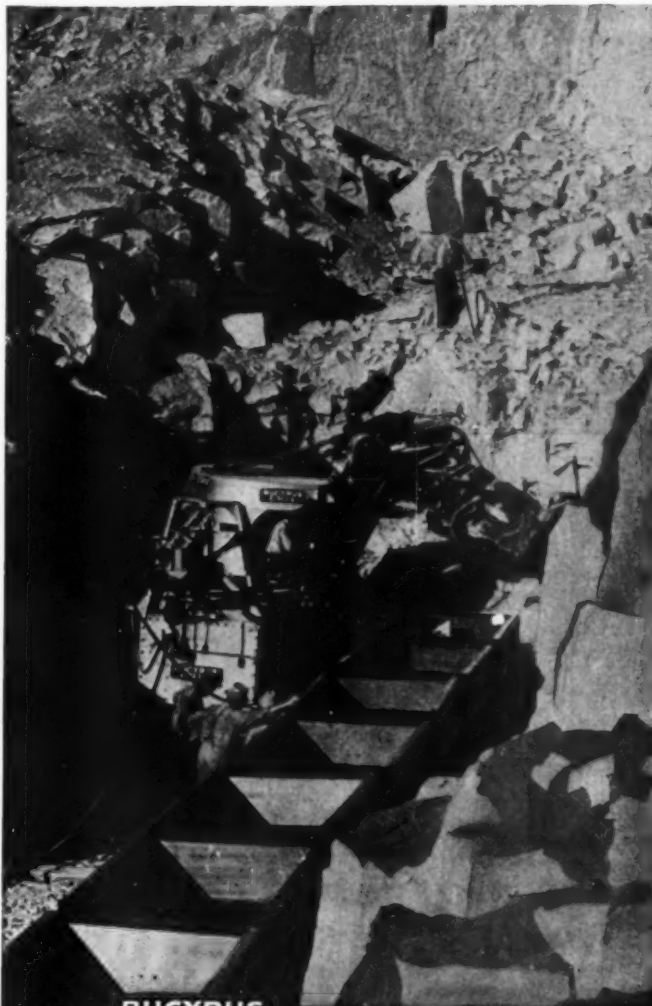


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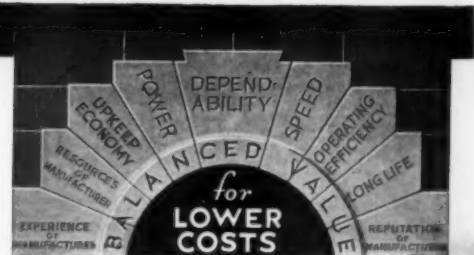
Photo by courtesy Los Angeles Times

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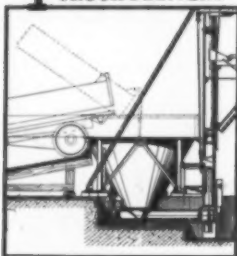


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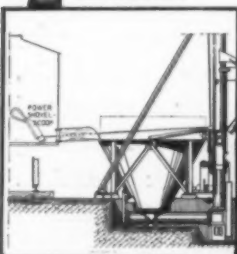
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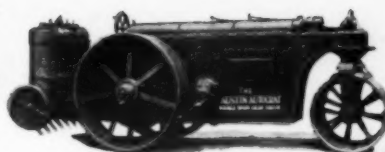
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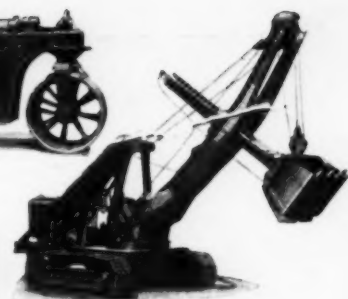
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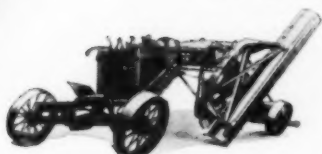
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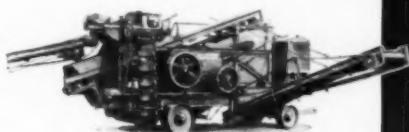
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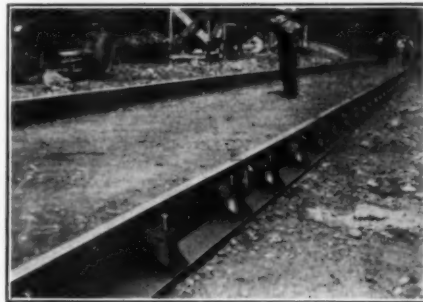
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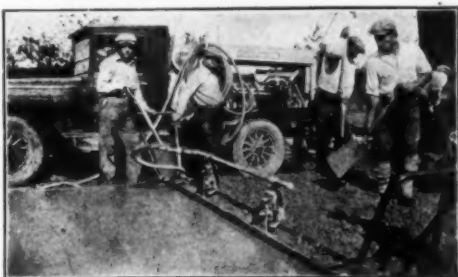
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THE Flexible Road Joint Machine Company wishes everybody, and especially YOU, Happiness and Prosperity.

We thank the thousands of contractors who have used our joint equipment and, in particular, the various Highway Departments which have labored to the end that our country may have excellent roads.

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Time Payments Available Through Our Own V. M. A. C.

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Looking Forward

in

Highway Construction



By

Thomas H. MacDonald

Chief, U. S. Bureau of Public Roads

LOOKING to the future of highway building in the United States in the coming year, we find that most prospective work has been given direction and impetus by the National Industrial Recovery Act. A large part of the funds made available under the \$400,000,000 appropriation for public works highways will be used during 1934. Predicted increases in motor vehicles indicate more ample funds for road building from motor vehicle and motor fuel taxes. However, new and pressing needs to meet changing traffic conditions indicate that a very large amount of work in road building must be accomplished to keep abreast of actual traffic requirements.

Realized needs are being met through the NIRA provisions that immediate attention be given to gaps in the highway system where Federal-aid roads pass through municipalities and where added highway facilities are needed on secondary roads to provide feeder connections to the main highways. The filling in of all gaps in the Federal-aid highway system without delay was given the impetus of first priority under the regulations adopted for the construction of public works highways.

In line with this tendency, money for public works highways has been apportioned so that not more than 50 per cent of a state's share is to be expended on the Federal-aid system outside of municipalities, not less than 25 per cent on extensions of Federal-aid roads into and through municipalities, and not more than 25 per cent on secondary or feeder roads.

The present status of public works highway projects as reflected by progress reports of December 16 shows that in the whole country projects advertised for contract represented 57 per cent of the \$400,000,000 appropriation made under Section 204 of the National Industrial Recovery Act. The speed with which projects have been placed under construction since last August indicates that the funds available will all be under contract within a few months. In fact, some states already have put to work practically all of their allotment of



Underwood & Underwood, Inc.

Thomas H. MacDonald

highway funds. New York State, on the same date, had under way 94 per cent of its allotment; Ohio, 73 per cent; and Pennsylvania, 74 per cent. At that time, 130,500 men were employed on 2,635 projects under construction. Projects already completed under the public works highway program totaled 365, involving an expenditure of \$9,552,000.

All possible speed consistent with safety of public funds has been encouraged by the Bureau of Public Roads in the beginning and prosecution of construction work. Procedure has been reduced to a minimum by provisions such as the reduction of required time of advertisement for

bids to two weeks, advertising work for bids immediately upon the approval of the project by the district engineers, abbreviated plans on secondary road projects following closely the existing highway, and the completion of plans for day labor work within a reasonable time after the beginning of construction.

While a few states lag somewhat in their progress, the program as a whole is advancing definitely toward completion, and the planning work of the State and Federal road building agencies is largely done. Once construction work is in progress, the planning and administrative agencies stand ready for new tasks. The peak of construction activities will come early this summer and by fall the entire program should be well advanced toward completion. As the work is completed, it is necessary to have new projects planned and ready to begin if the desired level of employment is to be maintained.

While much has been accomplished in highway development in past years, many things remain yet to be done. Included among the developments that will be in progress during the coming year are projects such as the elimination of traffic hazards, the filling in of gaps in the highway system, the improvement of through roads in cities and of feeder roads that provide access both to rural and urban industries, the coordination of all forms of transportation, and many

other new projects which are a natural development.

Changes in vehicles affect the roads over which the vehicles operate both as to the efficiency of the highways as traffic arteries, and also as to safety for vehicles and pedestrians. Chief among the developments in vehicles is the increase in speed. Higher vehicle speeds have made it necessary to redesign many features of our highways to eliminate traffic hazards and to meet other requirements of increased speed. The elimination of traffic hazards was directed in the National Industrial Recovery Act on projects such as the widening of narrow roadways and bridges, the separation of grades at crossings, the reconstruction of existing railroad grade crossings, the building of footpaths, the replacement of unsafe bridges, the construction of routes to avoid congested areas, or any other construction which will provide safer traffic facilities or definitely eliminate existing hazards to pedestrian or vehicle traffic.

SCOPE OF FEDERAL-AID WORK WIDENED

The entrance of the Government into new fields of highway improvement in city street construction and the building of secondary roads is a significant departure from Federal highway policies established in past years. It accents the necessity of state-wide planning of highway facilities. The high percentage of traffic that is of municipal origin and also the traffic on city streets contribute in a large measure to the annual highway income and major routes within cities should be brought up to adequate standards. In the planning of secondary roads, a proper relation must be maintained between such roads and the major highway system, and an annual income for their further improvement must be assured. There is also a distinct trend toward the control of secondary or feeder roads by the state highway departments. This simplification of highway administration has been stimulated by the requirements of the National Industrial Recovery Act.

A new and far-reaching development of the coming year will be the connection of highways with railroads as supplementary services. Railroads were built upon the presumption that highways would deliver freight to stations established along the route, an essential service in railroad operation. Changes in vehicles on the highways made possible a wider field of service and placed motor vehicles in competition with railroads in some cases. It seems probable that some unprofitable railroad mileage could be abandoned with profit and also some little-used highways. Coordination of highways not only with railroads but also with air and water facilities is contemplated in studies now in progress by Federal agencies.

MAINTENANCE WITH FEDERAL FUNDS

Highway maintenance under Federal-aid laws always has been obligatory as necessary for the protection of the large investment in improved highways. As a means of keeping the highway departments actively engaged as well-organized and smoothly-functioning agencies for public works in the relief of unemployment, highway maintenance can readily be expanded, especially on works that are in the nature of improvements. In addition to the repair of road surfaces, there is a great need on all highways for such work as widening shoulders and the inside of curves, laying tile drains and cobble gutters, building guard walls and right-of-way fences, and tree planting and other such landscape work. New emphasis has been placed on the landscaping of a reasonable mileage of wide right-of-way for we are no longer content to build roads and to neglect their appearance.

LABOR POLICY

The marked changes inaugurated in connection with the employment of labor under the NIRA will continue in the work of the coming year. Most of the Federal-aid work under construction is being accomplished by contract as in past years. Under the regulations adopted to control the work, the use of day labor hired directly by the highway authorities is permitted. Existing county or municipal organizations may be utilized but the responsibility for such day labor work rests with the state highway departments. Labor used on all classes of public works highways is obtained through local employment agencies designated by the United States Employment Service to prepare employment lists for both skilled and unskilled labor. Minimum wage rates are prescribed in all contracts for road construction and similar wage rates are used for day labor employed directly by the highway authorities. A 30-hour week is provided for in construction agreements or contracts with the use of the 130-hour month in special cases.

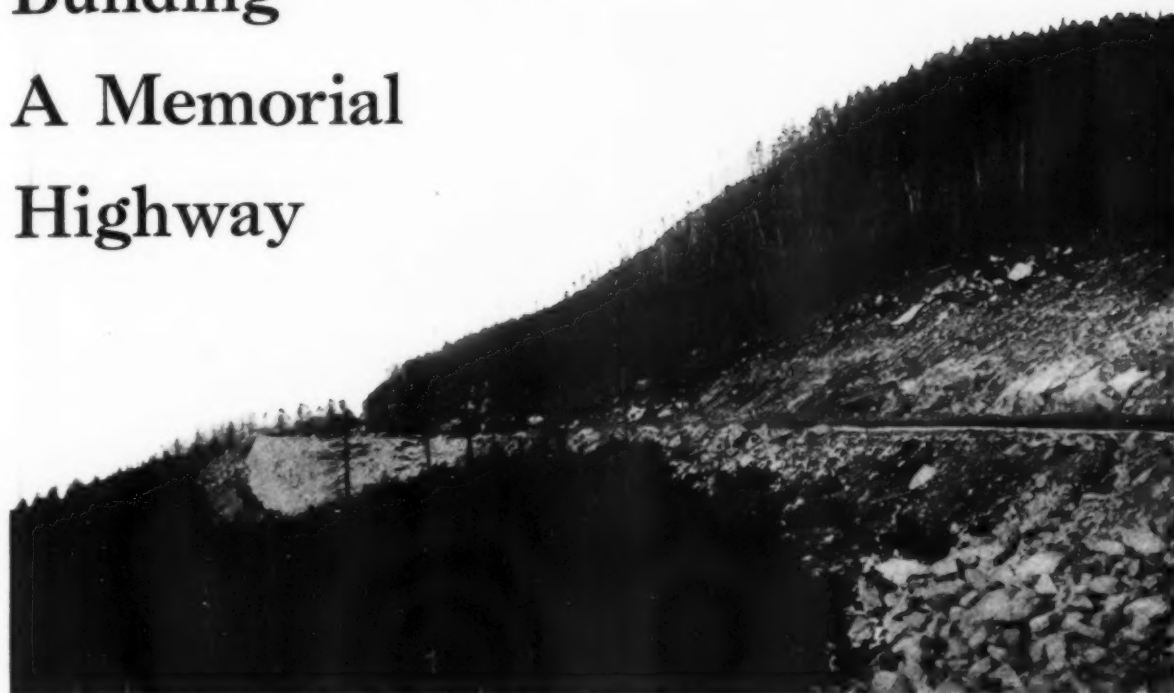
CONCLUSION

The coming year will see a larger measure of effort to meet both municipal and rural highway needs, to accomplish roadside beautification on wider rights-of-way, to eliminate traffic hazards, to coordinate transportation facilities, and to develop other new and needed highway projects to the end that unemployment will be relieved and the highway system of the country will be consolidated and improved. The National Industrial Recovery Act has established new criteria for highway work which have opened new fields for service.

Construction Lagging by \$14,000,000,000

The Federal Administration, through careful research, has determined that construction during 1934 and 1935 can absorb this vast sum in employment and the production of capital goods. Of this sum, the construction of express highways will use \$1,000,000,000; water and sewage works \$1,650,000,000; housing, \$4,533,000,000; public buildings, \$136,000,000; railways and terminals, \$2,000,000,000; and grade crossing elimination, \$2,400,000,000. The other items completing the total are educational facilities, recreational facilities, and industrial and commercial construction and modernization. In this study full recognition has been given to the fact that employment in the capital goods industries has declined 75 per cent and that stagnated construction has been a contributing factor to this decline in employment.

Building A Memorial Highway



IN the autumn of 1934, a new highway of unusual character will be open to motorists touring the Adirondacks in New York State. The New York World War Veterans Memorial Highway, winding 8.05 miles from the main highway at Wilmington, N. Y., goes around Marble Mountain, and Esther Mountain, to within 225 feet of the top of Whiteface Mountain which stands 4,872 feet above sea level. It is the highest peak within 30 miles although topped by several others in the Adirondack range. The highway has two hairpin turns, at the upper of which a parking space is to be made and at which during construction, the contractor located several service buildings.

The Whiteface Mountain Memorial Highway Commission, consisting of William H. Anderson of Troy, Chairman; J. Hubert Stevens of Lake Placid, Vice-Chairman; and Roger Prescott of Keeseville, Treasurer, was appointed by Franklin D. Roosevelt in 1929 while Governor of New York State. The contract for the construction of the highway was awarded on November 5, 1931, to the Hagedorn Contracting Co. of Lake Placid, N. Y.

CLEARING AND GRUBBING

Clearing and grubbing was started November 23, 1931, and continued throughout the winter until early in March, 1932, when the snow became too deep for further work. In May work was again started lower down and carried progressively to higher elevations as the snow melted. This portion of the work was finished in August, 1932. Clearing was particularly difficult because of so much fallen timber which had to be cut and split to dry for burning. The stand was very thick, a second growth of spruce, birch, tamarack and balsam

Penetration Macadam Pavement

8.05 Miles Long

Nearing Completion

at Whiteface Mountain,

Lake Placid, N. Y.

which continued, with the exception of the birch, to within 2 miles of the upper end of the highway. The specifications required that all timber cut during clearing and which measured over 6 inches in diameter should be piled for disposal by the Commission. The right-of-way which was cleared varied from 75 to 150 feet in width. Some of the illustrations show the character of the growth and its height. When clearing was carried on in winter, the stumps were cut 2 to 3 feet above ground because of the snow level which increased the size of the stumps to be removed later when grubbing was in progress.

The contractor paid a genuine compliment to the state highway engineers who conducted the original survey for this highway as it is a remarkable layout with low yardage, considering the difficulties encountered in the survey and the short sights which were possible with surveying instruments, because of the close character of the brush and larger growth. The average grade is only 8 per cent and at no point does it exceed 10



SOME OF THE PROBLEMS OF CLEARING, GRUBBING AND DRAINAGE

1. Fallen timber slowed up clearing and grubbing. 2. A typical timber stand at Sta. 380, showing the rough grade practically complete. 3. A triple 36-inch reinforced concrete culvert at the bottom of a 90-foot ravine at Sta. 347. 4. A 6 x 6-foot box culvert 148 feet long built on a 45-degree slope at Sta. 327.

per cent. When the contractor made his inspection of the location prior to bidding, it was necessary to crawl on hands and knees over certain sections because of deep ravines.

EXCAVATION AND FILLS

Excavation was started on December 23, 1931 at the lower end of the contract with a Lorain 75-B $1\frac{1}{2}$ -yard shovel equipped with a Waukesha engine working in a large sand cut. Another 75-B was started in January, 1932, at Sta. 200 working in earth until the first of March when the shovel had to quit because the frost was too deep. These two shovels were again put to work with a third, a Lorain 75-A of $1\frac{1}{4}$ -yard capacity with a Waukesha motor the last of May. The contractor also rented a Byers Master gas shovel for cleaning up in the cuts. With the exception of two through cuts, all of the excavation was side hill work and in spite of this only a very small amount of the material excavated was cast. The cuts and fills balanced so well that most of the excavated material was hauled direct to fill. Many boulders were encountered in the earth and sand cuts which greatly increased the difficulties of operation and reduced the daily yardage.

The 362,000 yards of unclassified excavation ran about one-third rock. This is the approximate figure which the contractor estimated in making his bid. In the top $2\frac{1}{2}$ miles of excavation it was difficult to get

enough dirt for a cushion over the rock subgrade and in some cases it was necessary to haul from borrow near the lower end of the job. All of the trucks used for handling excavation from the shovels were hired. There were several Linn tractors, White trucks and nine International Harvester trucks as well as three four-wheel-drive Walter trucks. There was an average of three trucks per shovel but they were shifted as required when the haul became too long for three trucks to keep a shovel busy.

All excavation was carried to a minimum of $1\frac{1}{2}$ feet below the final grade and then there was a minimum of 6 inches of backfill of earth, sand or gravel under the pavement where it went over a rock subgrade.

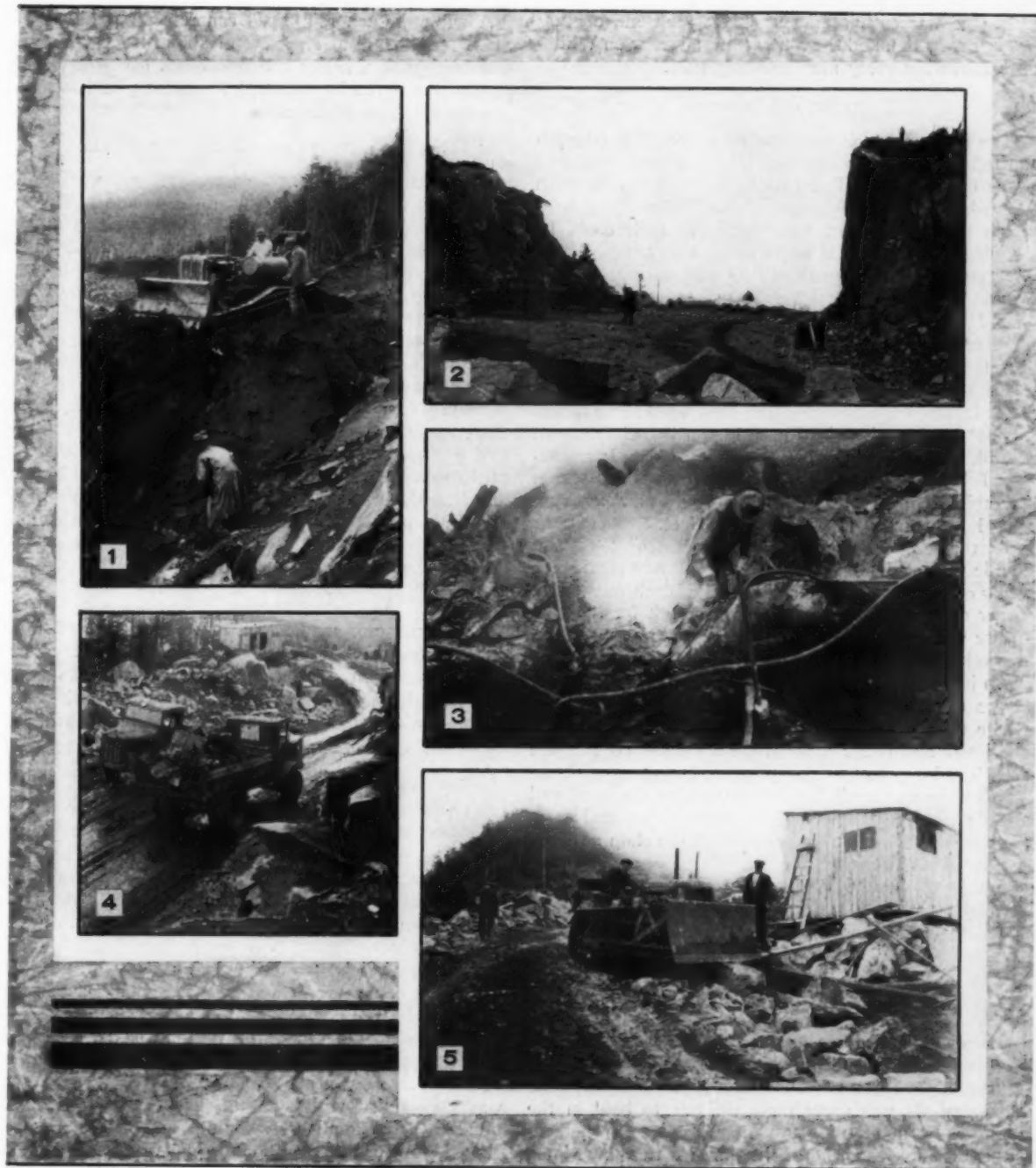
For spreading the rock, which sometimes ran to several tons in size, one Caterpillar Sixty and three Thirties were used. One of the Thirties carried a LaPlant-Choate bulldozer, another a Euclid bulldozer and the third pulled a Caterpillar 9-foot blade. The Sixty was used as a utility machine. In spreading the cover material for fine grade, a Wehr power grader was used and for heavier work a Galion E-Z lift leaning wheel grader.

In the fill no stone larger than 2 cubic feet was allowed within 2 feet of the subgrade. Because of the character of the rock and its breaking into large blocks, much block holing was required when the upper part of fills was being laid because of this requirement.

At Sta. 475 at the second hairpin turn, Elev. 4,400, there was a 30,000-yard cut 800 feet long and a 38,000-yard fill which also required 8,000 yards of dry retaining wall. The Walter trucks which worked at the 4,400-foot elevation were equipped with Wood bodies and hydraulic hoists. In the latter part of the excavation on the higher levels three 75-A Lorain shovels and the Byers Master shovel were used, the 75-B shovels hav-

ing been shifted to other work.

At Sta. 429 about 1,900 yards of rock were taken out in the winter of 1932-33 when the temperature ran as low as 40 degrees below zero. The entire right-of-way was filled with water at every blast as water-bearing seams in the rock were opened. The rock was so seamed that it did not break around the drill holes in many instances but only in the seams. The rock had a



ROUGH WORK BETWEEN ELEVATIONS 4,000 AND 4,400

1. A tractor and bulldozer placing fill over a concrete pipe culvert at the 4,200-foot elevation. 2. The only vertical rock face on the job at Sta. 427 + 50. 3. Drilling in very rough ground at the 4,400-foot elevation. 4. Two of the four-wheel-drive motor trucks which handled the rock on steep and slippery grades at the 4,400-foot level. 5. Hung up for a moment on one of the rocks which it is bulldozing into place near the upper end of the road. Note the cloud beginning to obscure the peak of the mountain.

horizontal cleavage or a slope down to the road in most sections which was disadvantageous in controlling the rock cuts to a definite line. At the first hairpin, however, an almost vertical face was secured at one point as shown in one of the illustrations.

The large amount of leaf mold on the ground and snowfalls ahead of the heavy frosts kept the ground free from frost but as soon as the shovels started to excavate the frost penetrated as much as 6 feet into the cuts. Ice was encountered as late as the end of July in the excavation and the contractor had snow on Whiteface Mountain every month during 1932.

DRILLING AND BLASTING

The first solid rock was reached at Sta. 270, (the job started at Sta. 68 + 38) and it was a poor grade of stone badly shattered and broke in large blocks when blasted. Its seamy character slowed up production so much that only about 1,000 yards of rock could be handled per day by the four shovels together. In large rock cuts the holes were drilled 4 feet on centers both ways. The drilling equipment consisted of four Sullivan 310-foot compressors installed at the 4,400-foot level and a Schramm compressor mounted on a Fordson tractor, which enabled it to move rapidly from place to place to handle small jobs. The contractor used fourteen Sullivan L-6 rotators with a maximum 16-foot steel equipped with Thurston detachable bits. In addition to the larger compressors one Ingersoll-Rand 110-foot and one Chicago Pneumatic 100-foot portable compressors were used with jack hammers running holes to an average depth of 8 feet.

At the second hairpin, at an elevation of 4,400 feet in a level spot sheltered by the large cut of 30,000 cubic yards of rock, the contractor located a blacksmith shop, larger compressors, workshop and a shack for the men to use when the weather came too bad to permit them to work throughout their entire shift.

An interesting bit of planning in the use of drill steel shows the care which had to be exercised on this job where transportation was exceedingly difficult between the lower and upper sections for a greater part of the job. The long steel was used at the top where a blacksmith shop was available for sharpening the steel and the detachable bits were used lower down and were sharpened with a Marberg grinder at the shop next the contractor's office.

Du Pont 40 and 60 per cent dynamite was used throughout the job. Prior to the end of September, 1933, about 40 tons were used and from then to the completion of the rock work about 20 tons additional were used.

DRAINAGE STRUCTURES

Because of the large number of new springs created by blasting and also the streams in the lower sections of the highway, numerous drains and culverts were necessary. It was exceedingly difficult to haul in the reinforced concrete pipe and the aggregate for the concrete box culverts ahead of the shovels. In many places it was necessary to detour the shovels around the sites for culverts, entailing additional excavation. Then as a grade was prepared over which ordinary trucks could haul, the culvert pipe and concrete aggregate were brought in and the culverts completed. Some of the reinforced concrete pipe culverts were on slopes as

great as 45 degrees and required substantial concrete anchors to hold them in place. All of the concrete for the headwalls and anchors was mixed by a Rex 7-S mixer which was hauled from point to point over the rough grade. The mortar for the joints of the concrete pipe was mixed in iron wheelbarrows as being the most convenient and flexible piece of equipment for use under the very rough conditions existing when the pipe culverts were being laid.

A triple 36-inch reinforced concrete pipe culvert at Sta. 347 was laid at an angle of about 45 degrees and was built with a heavy concrete block over the entire pipe where it ran beneath the 70-foot dry-laid wall to prevent crushing of the pipe.

STONE MASONRY AND RETAINING WALLS

The masonry guard rail, of which there was 4,800 linear feet, was laid with mortar and presents a very attractive appearance. In addition quarry stone guard rail was set up, there being approximately 2,500 units on 8-foot centers.

The dry-laid stone masonry retaining walls were massive structures running as much as 70 feet high and totaling 33,000 cubic yards. All of the stone for these walls was taken from rock excavation along the right-of-way. The huge stones which were handled with the Byers crane using chains were laid up with a 6-inch batter per foot on the outside leading toward the fill and a 3-inch batter on the inside leaning toward the fill so that the wall tapered 3 inches per foot of height and leaned toward the fill. The base of the walls were laid with one step 6 feet in an approximate horizontal plane and 6 feet vertical and then successive 3-foot steps to the back of the wall.

HOURS OF LABOR

The contractor worked an 8-hour day and 40-hour week throughout this contract except in winter when the job was shut down completely. Extra crews were maintained at all times to take care of extra work made necessary through delays due to weather, breakdowns or unusually difficult or hazardous work.

THE PENETRATION ASPHALT PAVEMENT

The paving was divided virtually into two sections: first, the lower 3 miles leading from the main highway at Wilmington to the toll house and the second section, the remaining 5 miles to the upper end of the highway. The elevation at the beginning of the highway at Wilmington is 1,039.8 and the elevation at the top 4,607.8.

The penetration macadam was laid as a three-course pavement, consisting of a foundation course, a bottom course and a top course. The foundation course was 5 inches thick of $2\frac{3}{4}$ to $4\frac{3}{4}$ -inch stone mixed as specified and spread with Galion spreader boxes in two strips with two men operating the boxes. This layer of stone was then rolled with a 10-ton Galion gas roller and filled with dry sand or screenings and broomed by a gang of four or five men and also by wire gang brooms pulled by the roller. Stone for the foundation course as well as the upper courses was quarried at Sta. 230 by a subcontractor, the Feola Construction Co. of Charleston, W. Va. The subcontractor also hauled and spread the stone, using eight Sterling trucks.

The bottom course was 4 inches thick and consisted

of $1\frac{1}{4}$ to $3\frac{3}{4}$ -inch stone, spread and rolled in the same way as the foundation course and filled dry in the same manner. Both the foundation and bottom courses were handbroomed to clean them thoroughly before the next stone was applied.

yard because of the grade and fact that the asphalt bled back. After penetration the road was choked with half and half No. 1 and No. 2 stone which consists of $\frac{1}{4}$ to $\frac{3}{4}$ and $\frac{3}{4}$ to $1\frac{1}{4}$ -inch stone respectively, hand cast from piles along the shoulders. This was rolled

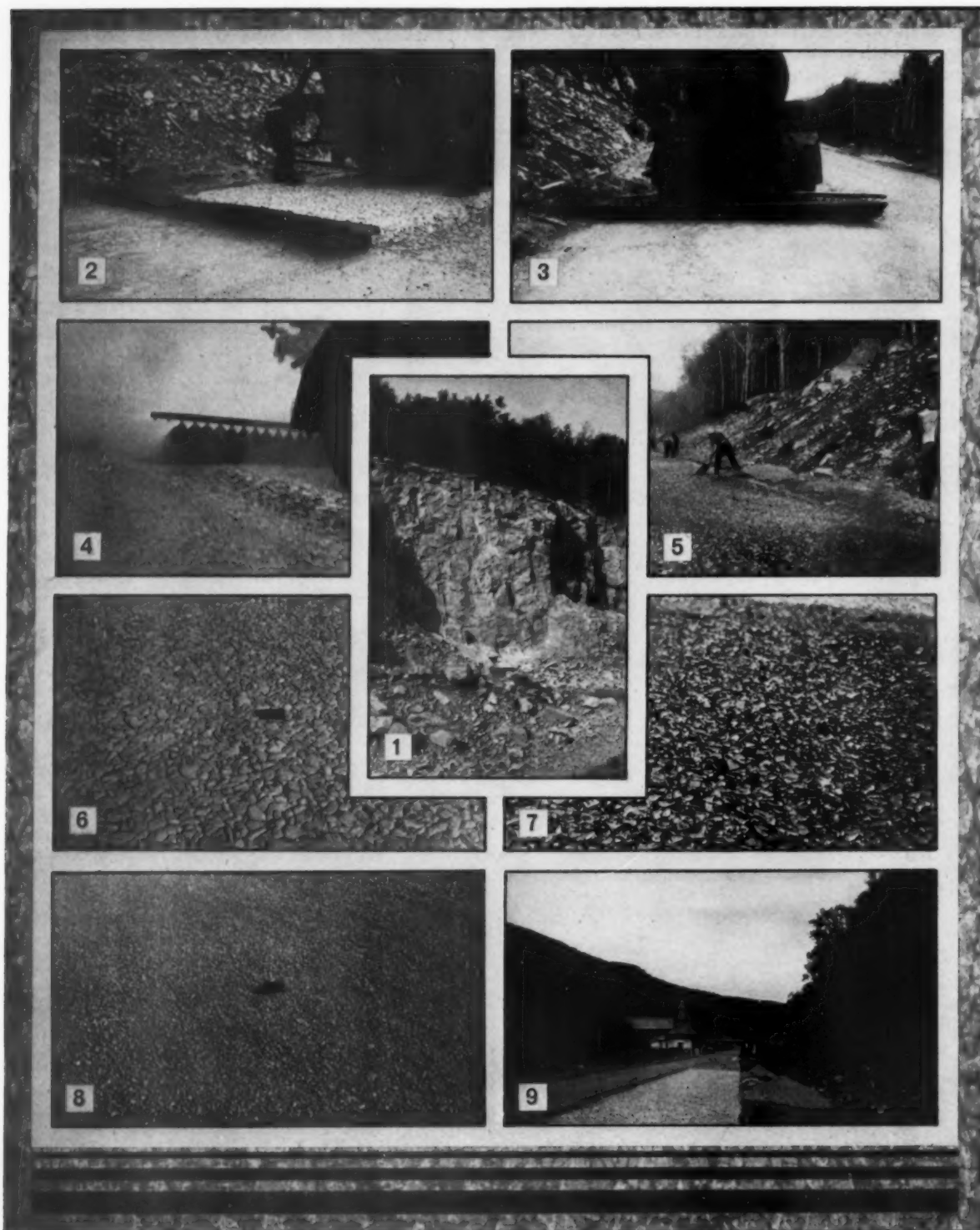


BUILDING THE DRY-LAID STONE-MASONRY RETAINING WALLS

1. The character of the blasted rock at the second hairpin. 2. A power shovel handling large rock for the base course of a wall. 3. Heavy rock laid up in lower courses near the upper end of the highway. 4. The long dry masonry retaining wall at Sta. 406. 5. A close-up of the face of one of the walls.

The top course was 3 inches thick of $1\frac{1}{4}$ to $2\frac{3}{4}$ -inch stone spread with the boxes and rolled. Then the lower 3 miles had two applications of bituminous material. The first application consisted of 2 gallons per square yard specified but later cut to $1\frac{3}{4}$ gallons per square

with a 10-ton roller and then sealed within 24 hours, weather permitting, with approximately $\frac{3}{4}$ -gallon specified, which was later cut to $\frac{1}{2}$ -gallon of bituminous material and choked with $\frac{1}{4}$ to $\frac{3}{4}$ -inch stone. This seal course was rolled and re-rolled and finally a $\frac{1}{4}$ -inch



LAYING THE BITUMINOUS MACADAM PAVEMENT ON THE MEMORIAL HIGHWAY ON WHITEFACE MOUNTAIN, LAKE PLACID, N. Y.

1. The 60-foot face of the quarry near the toll house which furnished all of the crushed stone for the penetration surfacing.
2. The trough used to catch the first flush of bituminous material from the distributor.
3. A snap shot taken at the instant the penetration started on a strip of the top course.
4. Matching up the second strip of penetration with the two outer nozzles of the spray bar plugged to prevent overlapping.
5. Hand spreading $\frac{1}{4}$ to $1\frac{1}{4}$ -inch stone immediately following penetration.
6. A close-up of the top course before penetration.
7. A close-up of the top course immediately after penetration and before choking.
8. The surface complete with a carpet coat of $\frac{1}{4}$ to $\frac{3}{4}$ -inch stone.
9. The toll house before completion, looking down grade.

wearing carpet of No. 1 stone from $\frac{1}{4}$ to $\frac{3}{4}$ -inch was spread by hand and after ten days broomed back by hand from the sides. In the upper section the method of construction was the same but no seal coat was applied and 2 gallons of penetration was applied throughout.

The asphaltic material was furnished by the Atlantic Refining Co., Philadelphia, Pa., which also applied it, hauling with four Kinney distributors from the tank cars at Au Sable Forks, 12 miles distant from the lower end of the job. The specifications called for asphaltic material of a penetration of 100 to 110 when applied before October 1 and of a penetration between 110 and 120 for application after October 1.

In applying the asphalt penetration, a trough was set up across the strips to catch the first flush of the bituminous material. Also at the end of a penetrated strip where it lapped on to a section which had previously been penetrated, the older section was covered with sand to prevent a fat spot.

GASOLINE SERVICE AND LUBRICATION

The four power shovels and the Walter trucks and tractors together used about 800 gallons of Sunoco gasoline daily. A 400-gallon tank mounted on a Ford truck made the run over the job twice a day, refueling every piece of equipment each time. This was a particularly hazardous piece of work as the top soil and water which flowed on to the subgrade was at times as slippery as axle grease, but there was usually a tractor handy to assist the truck over bad spots. At the contractor's office at the foot of the job two 500-gallon storage tanks were installed and were kept filled by the local Sunoco distributor.

The contractor used Mobiloil and Sunoco lubricants, using SAE 30 and as low as 20 in the compressors and shovels at the 4,400-foot elevation because of the cold. It was necessary to drain the radiators of all pieces of equipment every night from September 10 to the time the anti-freeze compound was put into the radiators. Straight kerosene was used in the radiators of the tractors and rollers during the first winter. The heat of the radiators caused a slight condensation of water which was drained off every night so as not to cause trouble in any section of the radiator.

QUANTITIES AND UNIT PRICES

Clearing and grubbing.....	Lump Sum	\$22,000 00
Unclassified excavation.....	362,000 cubic yards	.75
Preparation of fine grade.....	96,600 square yards	.10
Trimming shoulders.....	42,600 linear feet	.15
20-inch reinforced concrete pipe.....	4,100 linear feet	4.00
24-inch reinforced concrete pipe.....	1,580 linear feet	5.00
30-inch reinforced concrete pipe.....	165 linear feet	7.00
36-inch reinforced concrete pipe.....	762 linear feet	10.00
Portland cement.....	2,320 barrels	3.50
1:2:3½ concrete.....	220 cubic yards	20.00
1:2:4 concrete.....	550 cubic yards	20.00
1:2½:6 concrete.....	66 cubic yards	12.00
Stone masonry laid dry.....	33,000 cubic yards	4.00
Fabric reinforcing.....	1,700 square feet	.20
Bar reinforcing.....	20,000 pounds	.06
Guard rail (masonry).....	4,800 linear feet	2.50
Cable guard rail.....	7,700 linear feet	.80
Quarry stone guard rail.....	2,300 units	3.00
Foundation course, broken stone.....	13,900 cubic yards	4.00
(Complete in place)		
Bottom course (Complete in place).....	10,750 cubic yards	4.50
Top course, bituminous macadam penetration.....	6,048 cubic yards (3 miles)	5.00
Bituminous material A penetration.....	205,000 gallons	.12
Total approximate.....		\$700,000 00

PERSONNEL

This most unusual and exceedingly difficult piece of highway construction is being built by the Hagedorn

Contracting Co. of Lake Placid, N. Y., with H. Hagedorn, President and W. Rushton Ross as Superintendent. While the financing is being handled by the Whiteface Mountain Memorial Highway Commission through the sale of bonds to be retired by nominal tolls, the actual construction is being supervised by the Engineering Department of the New York State Department of Public Works under the direction of J. Willard Holler, District Engineer with W. C. La Row as Resident Engineer.

EDITOR'S NOTE: This job was closed down November 17, 1933, because of the early arrival of severe winter weather. The snow was too deep to get up the mountain and the cold too intense for the men. Work will be resumed as soon as possible next spring.

Explosives Used in Meeting Man's Greatest Needs

A GREAT contribution to meeting one of man's greatest needs is made by explosives. Glancing at the utility of dynamite for use in the construction of water tunnels, it is found that, while far fewer people have seen such bores than have ridden through railroad tunnels, some of those to convey water greatly exceed in length any ever built for railway purposes. To mention a few of the great water tunnels, there are the Chicago tunnels, one of which is 8.2 miles long, which bring water from a crib miles out in Lake Michigan to the pumping stations; the Sugar Loaf, Gulph and Great Hill tunnels in Connecticut, of 13,200 feet, 4,700 feet and 2,600 feet in length respectively; and, deservedly ranking among the great engineering achievements, the bores through solid rock to supply water to New York City and adjacent areas, which include the great tube extending for a distance of 20 miles from the Hill View Reservoir in Yonkers to South Brooklyn. In addition to the tunnel, there were constructed seventeen shafts, 16 feet in diameter, with an average depth of 600 feet. In all, more than 1,600,000 cubic yards of material, mostly rock, was removed from the tunnel and shafts and a total of more than 8,000,000 pounds of dynamite was used. On the Pacific Coast is the mountain division tunnel of Hetch Hetchy Aqueduct, the municipal water supply and hydro-electric power tunnel for the city and county of San Francisco, Calif., which has a length of 18.8 miles. The Coldbrook-Wachusett Tunnel for supplying water to Boston, Mass., has a length of 13 miles between Ware River and the Wachusett Reservoir.

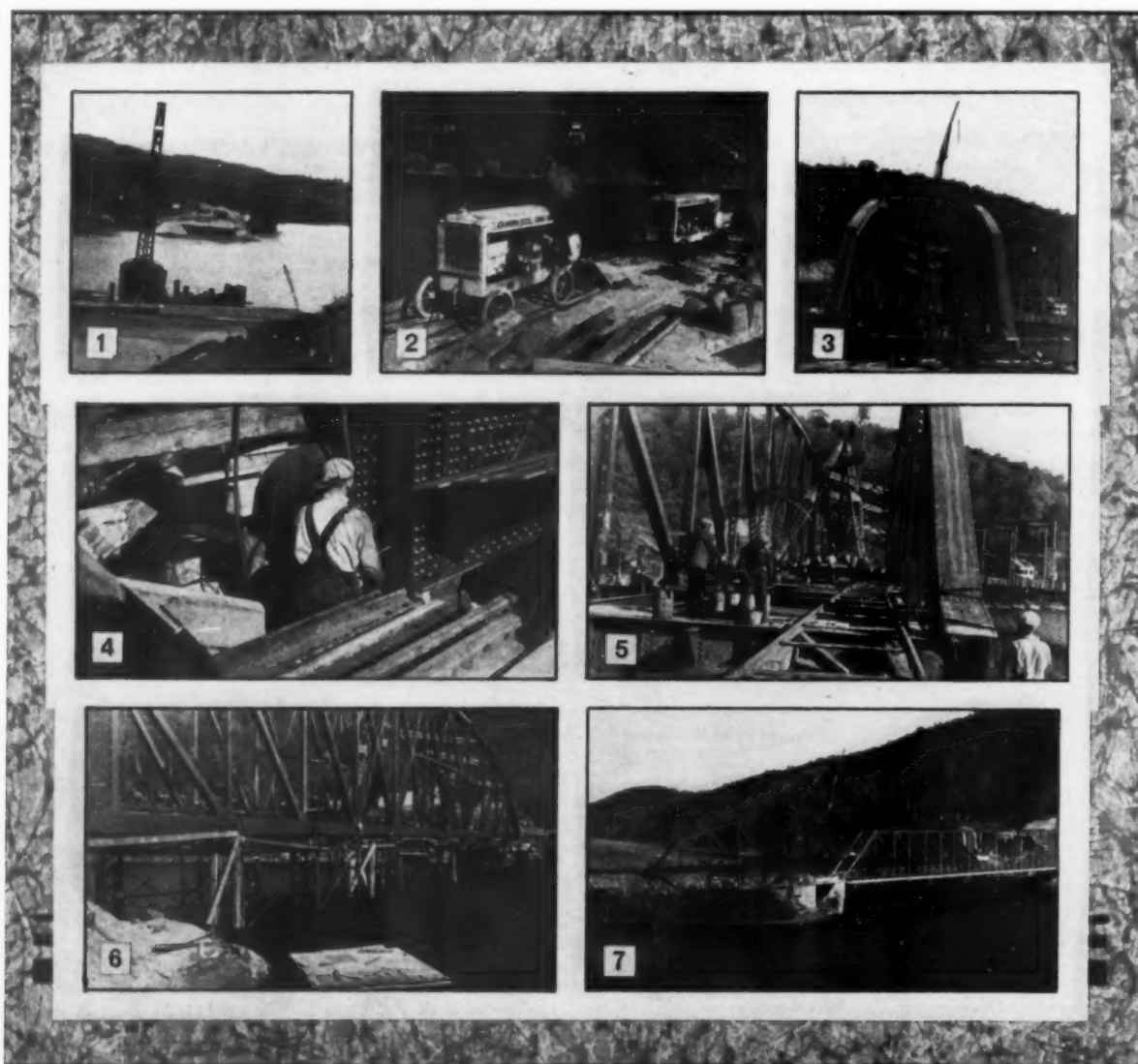
River and harbor improvements, increasing transportation facilities, are also important contributions to the welfare of man. Over the span of years from 1866 when nitroglycerin was first used for blasting the rocks of Hell Gate to 1933, high explosives have contributed tremendously to the deepening of rivers and the development of harbors for the water-borne commerce of the world. New York City owes its importance as a port largely to what dynamite helped to do in providing a sufficient depth for Hell Gate channel, more properly the East River channel, a stretch of about 16 miles of navigable water. Another example is the harbor at Long Beach, Calif., the largest artificial harbor in the world. The jetties that extend far out into the Pacific are built of rock, blasted with dynamite. At Miami, Fla., is one of the important harbors on the Atlantic Coast. It is there because dynamite blasted the rocky under-surface barrier of a shallow bay. More and more, the Mississippi is fulfilling its destiny as a great artery of commerce, due to the use of high explosives. In the Middle West is the Detroit River from which vast yardage of rock was blasted. Though but 28 miles in length, this stream handles more tonnage annually than any other waterway of the world. The Panama Canal was to a great extent made possible by the use of dynamite. Eventually the St. Lawrence River will take its proper place in the world of commerce because high explosives are available for this river's deepening and improvement.

A New 300-Foot Steel Truss Bridge

ELIMINATING one bad right-angle turn and with future heavy grading making possible the complete elimination of a second right-angle turn, the Connecticut State Highway Department awarded a contract for a 300-foot steel truss bridge at Sandy Hook over Lake Zoar during the summer of 1933 to the Lee Construction Co. of Boston, Mass. The steel work was subbed to Lackawanna Steel Construction Corp., Buffalo, N. Y., by the general contractor. This bridge, which is 300 feet long center to center of pins, 50 feet high and carries a 34-foot roadway, weighs in the neighborhood of 550 tons. The floor beams are built girders 48 inches deep with $\frac{5}{8}$ -inch cover plates

top and bottom. The stringers are rolled Bethlehem 24-inch I-beams.

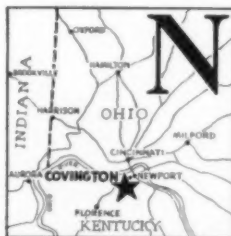
The steel contractor set a stiffleg derrick on a nearby branch of the New York, New Haven & Hartford Railway on September 27, 1933, about $\frac{1}{4}$ -mile from the site and received and began to erect steel on October 1. The steel erection was complete with the bottom chord driven and the falsework removed on October 20. The final riveting was completed and the contractor moved off the job two weeks later. John Kitson was Superintendent for Lee Construction Co., and H. E. Golliner was Job Superintendent for Lackawanna Steel Construction Corp.



STEEL ERECTION AT THE SANDY HOOK, CONN., BRIDGE

1. The abutments and backfilling. 2. Refueling the compressors that supplied the pneumatic riveters. 3. A shot across the bridge showing the derrick and trusses. 4. Preparing to rivet the end post. 5. Two forges were kept busy. 6. The falsework. 7. The old and new bridges.

Doubling the Width of a 19-Year Old Concrete Pavement



NINETEEN years ago the State of Kentucky was proud of its first concrete pavements constructed at that time. One of them was laid 18 feet wide on the Covington-Lexington Highway, now U. S. Route 25, just south of Covington, Ky. By coincidence, the same District Engineer, M. D.

Ross, was in charge of this work at that time and, after these many years, holds the same position and sees this road, nineteen years old, widened into a modern 40-foot highway, the widest concrete road in the state highway system of Kentucky.

OLD PAVEMENT BROKEN UP FOR REMOVAL

The old concrete pavement, the pride of nearly two decades ago, was broken up with a "skull cracker" for a width of 10 feet, leaving 8 feet for the use of the heavy traffic on this highway.

A crane mounted on a truck was used to handle the 2,500-pound pear-shaped ball that was dropped at intervals, smashing the old pavement so that it could be readily handled by the steam shovel. The "rock" produced by the breaking of the concrete was taken out by a 1-yard Bucyrus-Erie steam shovel and the remaining dirt for grading to the new line and grade was taken out with a Northwest $\frac{5}{8}$ -yard shovel powered with a Wisconsin motor. To increase the output of the shovel a man was employed at 25 cents an hour to trip the bucket.

Grading was followed through with a Warco grader powered with a McCormick-Deering tractor which shaped the grade to approximately final contour. The grading crew then ran in the forms with four men on the trenches and then one man set the forms with the others as helpers. Blaw-Knox 9-inch steel forms were used on the outside and on the first strip 7-inch Heltzel forms were used on the inside. When the second strip was poured, the first strip acted as the inside form with a line of Truscon center steel set against the first slab to bond them. A crew of twelve men handled the fine grading between the forms. A Cleveland planer pulled

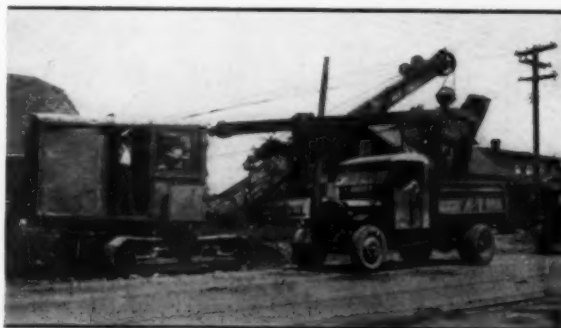
*John G. Exterkamp,
of Covington, Ky.,
Maintained Traffic
by Telephone System
on 8-Foot Remnant
of Old Pavement*

by a motor truck, instead of by the paver, furnished the final check on the subgrade. The final grade was compacted with an Austin Pup 5-ton roller.

WEATHER CONDITIONS SLOWED UP THE PAVER

The contractor raised his head and wailed at the conditions created by the weather in the early weeks of this contract. For nine consecutive days the paver rested on one spot because of rain. This same wail was heard from all contractors who had grading or paving jobs running in the early spring of 1933.

One man of the concrete crew oiled the forms ahead



Grading Alongside the Old Concrete Slab

of the paver and helped set the Truscon steel center joint with 4-foot dowels every 5 feet. These $\frac{1}{2}$ -inch dowels were supported by bent wire chairs at both ends. A gage bar was used to center the steel during setting. The center steel and the pins for holding it were carried conveniently on the paver. Two men dumped the cement from the bags, which had been set up on the grade between the forms, into the paver skip while one man with them opened the sacks and picked up the empties and packed them for return to the cement car.

One man dumped the batch trucks, and the operator for the Rex 27-E paver also oiled it. Three men spaded the concrete when the paver was running on the grade between the forms, but four were required when the paver ran on the side. The spaders were followed closely by the Ord double-screed finishing machine. The operator let down the finishing belt on the back of the machine on the second run over the new slab. The pit men not only did the usual shoveling but also spaded the sides and shoveled to the strike-off of the finishing machine. Poor weather and grade conditions somewhat reduced the daily average of the paver which laid about 1,160 feet per working day. The paver and entire labor crew was worked two 7-hour shifts a day. The 30-hour time limit did not cause much worry for the contractor during the early part of the contract, because the weather automatically kept the possible working hours far below that. It was planned, as soon as weather con-

ditions were favorable to continuous work, that the crews would work two 8-hour and two 7-hour shifts a week.

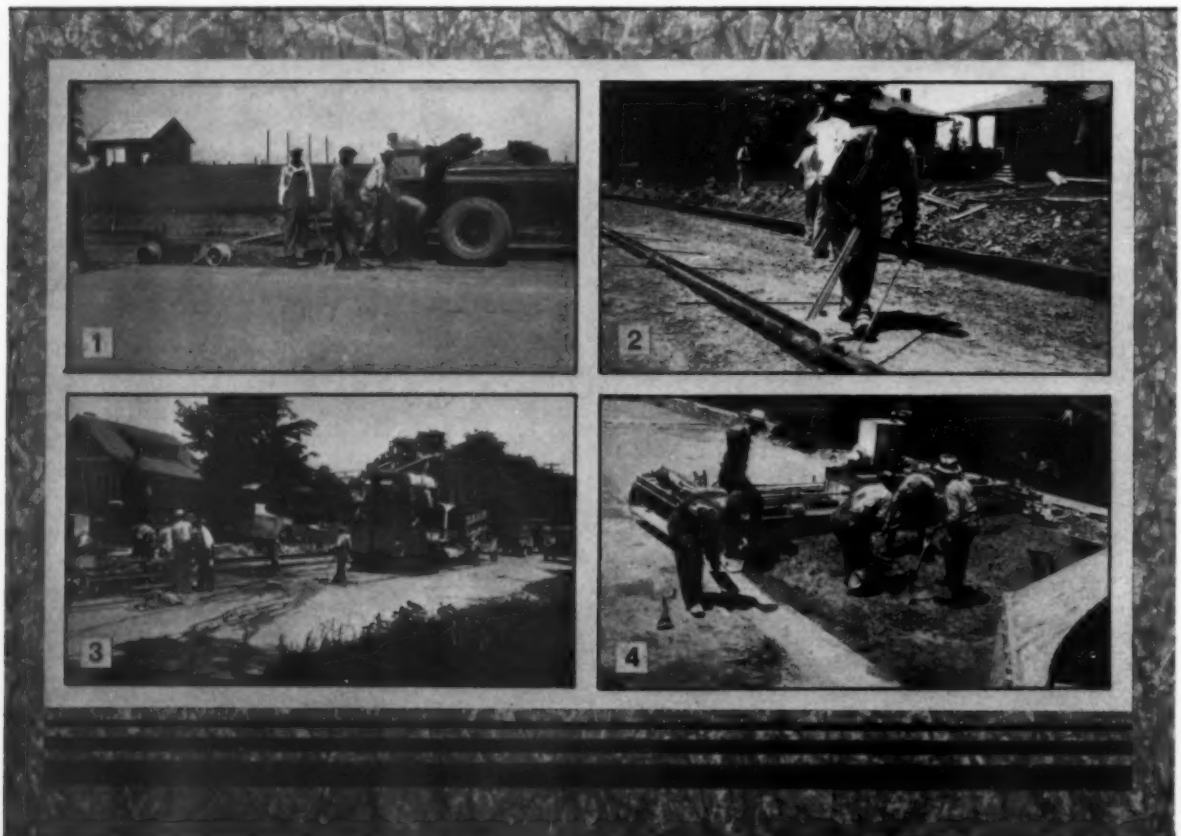
FINISHING AND CURING

There were two finishers who used long-handled floats and the hand edgers along the forms and followed up with a canvas belt and last a burlap drag. There were two burlap men who sprinkled the burlap and then spread it on the finished slab from a 4-wheel burlap bridge. The following morning the burlap was removed and the state inspector checked the pavement with a straight-edge. A truck with a driver and four or five helpers placed the straw immediately following the checking of the pavement by the inspector.

WATER SUPPLY

Water for all the work on this job was taken from the fire hydrants of the Kenton County Water District. These hydrants were spaced from 200 to 500 feet apart. The contractor used a 5-foot flexible hose connection to the hydrant and then about 75 feet of 2-inch galvanized iron pipe with a T at the end. The $\frac{1}{2}$ -inch paver hose was attached to one leg of the T and a standard spigot for the sprinkler hose at the other leg of the T. The contractor used the regular tap as he said the men were more used to that kind of a shut-off for a hose than a

(Continued on page 28)



FINE GRADING AND POURING THE WIDENING SLAB

1. The final checking of the grade with a subgrade planer. 2. Threading dowels through the steel center joint. 3. The paver running on wood mats on the old concrete slab. 4. The puddlers and the finishing machine, showing one man cleaning the old slab ahead of the finishing machine.

The Lubrication of Construction Equipment

*The First of a Series on a Very Important Phase
of Efficient and Economical Operation*

THE construction of most equipment designed for use by contractors is of a different character than is found in industrial plants. The nature of the required duties of such equipment necessitates a deviation from practices followed by designing engineers, inasmuch as the operating conditions require machinery of sturdy build to withstand the rigorous duties imposed upon it.

Such equipment invariably operates under unusually dirty conditions and is subject to excessive vibration, due to the instability of its foundations. It is exposed to widely varying atmospheric conditions, tending to create rapid deterioration, and is subjected to the extremes of seasonal heat and cold.

These combined conditions require what might be termed "specialized" lubrication to obtain the maximum of efficiency, prolonged life of bearings and economical operation. The average contractor or engineer may be likened to the farmer who operated machinery prior to the advent of the automobile. He considered his equipment a necessary evil, and gave little or no thought to its proper lubrication, applying a squirt of oil here, or a squirt of oil there, when a squeak would develop. This obviously resulted in rapid deterioration. Today the farmer is educated to the importance of proper lubricants and lubrication for his various mechanical devices, having acquired his knowledge through the use of his automotive equipment.

WHY LUBRICATE?

The primary function of modern lubrication is to prevent actual contact between bearing surfaces when in operation. This is accomplished by the interposition of a film of lubricant over the entire area of these surfaces and maintaining this film throughout the duration of operation. The failure of this film to function properly creates excessive friction, resulting not only in rapid deterioration of bearings, but materially increasing power and fuel consumption.

Parts replacement, made necessary by the use of improper or inferior lubricants, is in itself an important factor in operating costs, but this added to the labor involved in making repairs, combined with the value of the time the unit is idle during this period, involves an expense worthy of deep consideration.

Very few contractors maintain complete records of lubrication costs, incorporating all contributing factors to that expense. Invariably their accounts show merely the actual costs of oils, greases and compounds consumed over a given period, plus the additional expense of labor for oilers. Such costs are inaccurate unless they also include the extra repair costs which are the inevitable accompaniment of improper or inadequate lubrication. The slightly greater cost of proper lubricants reduces repair costs and effects a net saving in operating costs through their use.

It is the general practice to lubricate equipment at stated intervals, using approximately the same amount of lubricant for each application. This invariably creates the impression in the mind of the operator that a low-priced lubricant is as satisfactory for his purpose

This is the first of a series of twelve practical, non-technical articles on the lubrication of construction equipment, which will show the importance of lubrication in preventing damage to equipment, costly shutdowns for repairs and expensive replacements. They will discuss the proper lubricants for each type of equipment and the lubricant and methods of application for each part of each piece of machinery in general use. This series of articles is offered to promote greater thought and more care in the use of lubricants to decrease operating costs and to increase the efficiency of construction equipment. Discussions and questions from our readers will be welcomed.

as the more expensive products, and therefore, more economical.

This manner of reasoning is fallacious, as invariably the cheaper lubricants, especially the grease type, are manufactured with the cheapest ingredients obtainable which will permit of the manufacturer offering an otherwise attractive product to his customer. Such types of lubricants cannot possess the sustaining properties demanded of a lubricant to be used for heavy-duty purposes. They break down quickly under pressure and heat and do not maintain a substantial, sustaining film between the bearing surfaces. This permits of metal to metal contact, creating excessive wear of bearing parts which reflects directly on fuel consumption, to overcome the attendant increased friction generated. All bearing surfaces, no matter how smooth they may apparently be, have innumerable protuberances and depressions which are most perceptible when viewed through a strong magnifying glass. It is essential that these be kept separated each from the other to obtain the least possible friction, with the resultant conservation of bearings.

LUBRICATION THEORIES VARY

There is a divergence of opinion among the engineering fraternity as to the relative values of oil and grease lubricants. One faction maintains that a constant flow of oil of correct viscosity between bearing surfaces not only prevents metallic contact but tends to carry off a certain volume of frictional heat, sustaining more normal temperature of bearings. This contention is accentuated by the fact that grease lubricants create a greater fluid friction than oils, due to their heavier body.

To controvert these theories, the other group of engineers maintains grease lubricants have greater sustaining properties, due to their general construction, which insures a stronger and more permanent lubricant film to prevent contact of bearing surfaces. They believe that such fluid friction as may be developed by the use of grease lubricants does not reflect on power consumption to such an extent as to offset the greater friction accruing through a closer metallic contact. Furthermore, they contend that, due to bearing construction generally, it is impossible to contain and maintain oil within a bearing with any degree of permanency, resulting in excessive waste and greatly increased expense. On the other hand, a grease lubricant "stays put" until worn out.

Both types of lubricants have their virtues and economic advantages, and it is the editor's purpose and intent to define these in as concise and practical manner as possible in the succeeding articles, that the mind of the contractor or operator may be clarified and that he may select those types of lubricants which best suits his purpose for his particular type of mechanical units and operating conditions.

Doubling the Width of a 19-Year Old Concrete Pavement

(Continued from page 26)

small gate valve. Prior to the pouring of the concrete, new valve boxes were placed in the grade by the water company. These and the numerous valve boxes of the gas company made the work more like city paving than like state highway work.

Contractors in the middle west and south are used to

having the road turned over to their exclusive use when they start a paving contract and hence are more disconcerted when they are required to maintain traffic than are eastern contractors who have to face that difficulty constantly because of state highway department policies. This contractor had a minimum of trouble with traffic as regards accidents, considering that the weather was very unfavorable to the maintenance of traffic over a broken concrete pavement which was to be removed. During a cloudburst a through bus mired in the mud along the grade, but otherwise traffic was put through promptly. When traffic was handled on the remaining 8-foot strip of old concrete while the first new 20-foot strip was being poured, a telephone dispatch system was used. A flag system to move traffic around the paver and batch trucks was all that was needed when pouring the second strip.

PERSONNEL

This widened project was paved by John G. Exterkamp of Covington, Ky., for whom G. D. Davies was Engineer and Mr. Exterkamp acted as his own Superintendent. For the State Highway Department, J. C. Moore was Resident Engineer under M. D. Ross, District Engineer. This project was in the road district of J. Lyter Donaldson, Commissioner, of Carrollton, Ky., with M. D. Ross, District Engineer, George S. Lyon, Assistant District Engineer, and John C. Moore, Resident Engineer, in charge for the State Highway Department.

The 1933 Book of A.S.T.M. Standards

THE Book of A. S. T. M. Standards, which is published every three years, contains all of the standard specifications, methods of testing, definitions and recommended practices adopted by the Society. The 1933 edition is issued in two parts, Part I containing 1,000 pages including all standards relating to metals and Part II, of 1,300 pages, covering non-metallic materials.

Of the 185 standards in Part I, 104 cover ferrous metals, while 70 relate to non-ferrous metals and 11 involve metallography and general testing methods. Part II contains 285 standards covering many widely used materials, including cement, refractories, coals, paints, petroleum products, rubber products and many others.

Supplements containing any standards adopted in 1934 and 1935 will be furnished without charge to all purchasers of either part of the book. Copies of this publication may be secured from the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa. Part I and Part II in separate volumes are \$7.50 each, cloth bound, and \$9.00 each in half leather. The complete book in one volume is \$14.00, cloth bound, and \$17.00 in half leather.

Contractor Lands Contract Through Use of Air-Express

WELDING SERVICE, INC., of San Francisco, Calif., was able to land a \$300,000 Grand Canyon road contract through the use of air-express. In order to have their bids delivered on time in Phoenix, Ariz., the contractor obtained blanks from the Federal office and forwarded them by railway express-plane to Los Angeles. They were met at the airport by officials from the contracting firm, the contract blanks were filled in and carried on the next plane by a representative to the Arizona capital. He was able to deliver the bids on time and obtained the contract the following morning.

Resurfacing 7.3 Miles

of



Old Concrete

with

Black Top

Republic Asphalt Paving Co.

of Dayton, Ohio,

Handled Resurfacing

with 10-Mile Haul

from Own Plant

IN order to use an existing hot-mix plant at its own yard in Dayton, Ohio, the Republic Asphalt Paving Co. was forced to haul every pound of the T-5 wearing surface, binder and wedge course material 10 miles to its 7.3-mile contract approximately 10 miles west of Dayton, Ohio, on Route 11, the main highway from Dayton to Indianapolis. The advantages far offset the long dead haul, for the plant is semi-permanent in nature and the operating personnel know the set-up perfectly. A shift to a new and temporary location would have meant certain disadvantages as regards methods of handling the various materials.

PRELIMINARY WORK

Prior to the resurfacing it was necessary to pour a 4-foot widening strip of concrete on the south side of the old concrete road to give a 20-foot base for the hot mix. The widening strip was 7 inches thick and had a 9-inch curb to hold the asphalt top. There was no widening strip on the north side of the pavement as it is expected that at some later date, if the traction company should abandon its right-of-way, the pavement will be widened again on that side. No curb was provided on the north side, thus requiring the use of steel asphalt forms against which the top was laid. The

south curb was 2 inches high and the north forms the same height.

In order to furnish a relatively uniform surface on which to lay the top, it was necessary, for most of the length of the contract, to lay a wedge of binder material involving about 1,300 cubic yards of material.

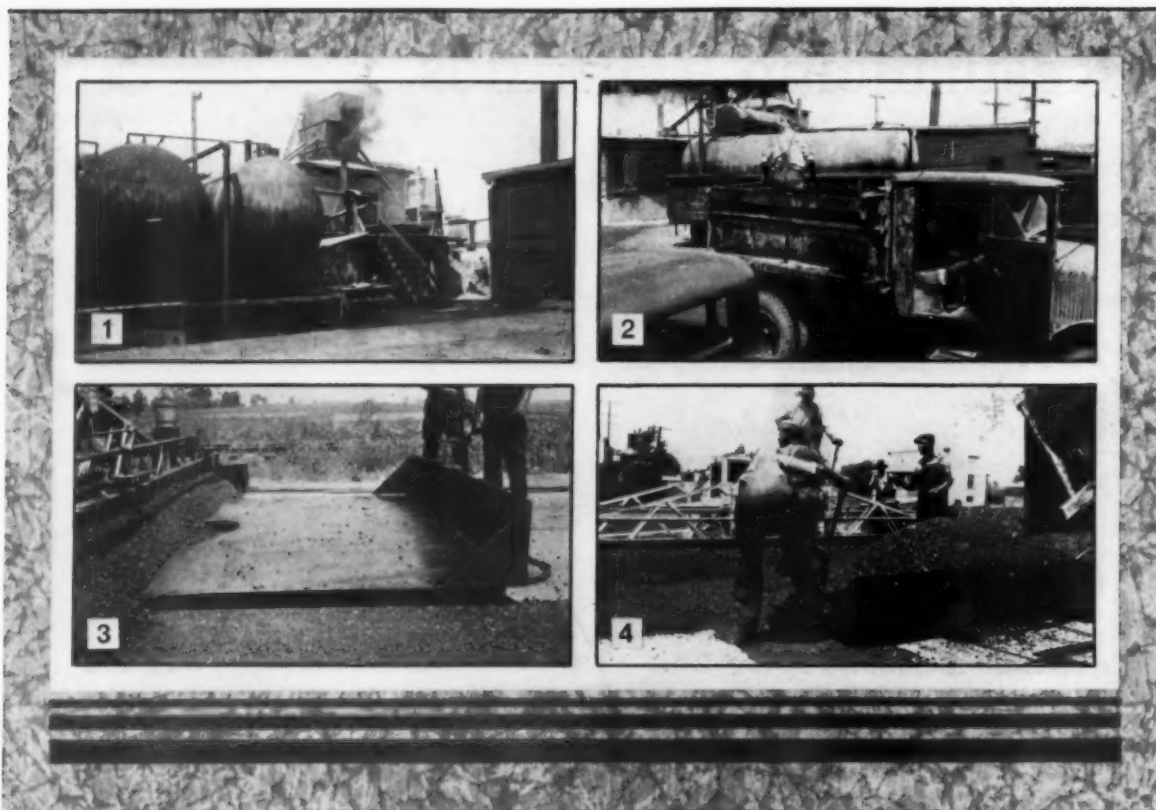
THE ASPHALT PLANT

The plant of the Republic Asphalt Paving Co. is located in Dayton in the northwest section of the city on a B & O spur track. The stone aggregates were purchased from the National Lime & Stone Co. of Lima, Ohio, and were delivered by rail to the aggregate spur track. They were unloaded from the gondola cars by a Thew steam shovel with a 42-foot boom and a 1-yard Lakewood clamshell bucket to the stockpiles behind barricades, through gates in which the material was fed to the bucket elevator of the plant. Sand was delivered by truck by the Moraine Sand Co. of Dayton, to another stockpile from which it was similarly fed to the drier by a bucket elevator.

The asphalt plant, a Cummer 1,250-yard plant, consists of the two bucket elevators for the cold materials



The 750-Gallon Utility Truck Which Hauled Water for the Steam Rollers



MIXING, HAULING AND SPREADING THE HOT MIX

1. The asphalt mixing plant and asphalt storage tanks. 2. Swabbing out one of the fleet of eight hauling trucks before loading with hot mix. 3. The steel dumping board, showing the semi-circular safety hole. 4. Shoveling the hot mix from the dumping board to the subgrade.

delivering them to the drier, and thence by the hot elevator to the hot bin screens which separates the material into four sizes delivered into four separate bins. The elevators and drier are electrically driven and the asphalt pump and mixing box are heated by steam from a boiler which is operated 24 hours a day to insure that the plant will be ready for operation instantly when work starts each week-day morning.

The operating crew consists of the crane operator, one oiler for the plant, a day and a night engineer for the boiler plant, one man feeding sand to the cold elevator and another feeding to the aggregate elevator on the opposite side of the plant, one man weighing aggregate in four separate weigh buckets, one man weighing asphalt and operating and dumping the mixer. The asphalt weigh bucket is of the new Cummer insulated type and the asphalt is sprayed into the mixer through a series of nozzles, giving a uniform distribution of the binder and speeding up the mixing. A large dial Howe scale set up at one side of the weighing platform shows the weights of aggregates from the four separate bins. The asphalt content is shown on a separate scale and the time of the mix is regulated by a General Electric timing device and maintained at 55 seconds.

Texaco asphalt was delivered to the plant in insulated tank cars from Lawrenceville, Ill., and pumped by the steam-jacketed asphalt pump to the two 10,000-gallon storage tanks and by the same pump as needed to the weighing bucket. The batches were dumped

directly into the trucks with no intermediate storage. The trucks received fifteen 800-pound batches of either top or binder as required. When the required number were delivered, the mixer man blew a whistle to tell the driver that the truck was loaded. He immediately covered the truck body with a tarpaulin and pulled out for the job. The truck bodies were swabbed out before loading on every trip to prevent the batches sticking. That this was effective was evidenced by the clean dump of every batch at the road. A fleet of eight trucks did the hauling.

The weights of the various aggregates and asphalt in the binder and top courses were as follows:

BINDER COURSE, PER BATCH	
Sand ($\frac{3}{8}$ -inch).....	252 pounds
No. 2 stone ($\frac{1}{2}$ -inch and retained on $\frac{3}{4}$ -inch screen).....	252 pounds
No. 3 stone (1-inch and retained on $\frac{1}{2}$ -inch screen).....	231 pounds
No. 4 stone (1½-inch and retained on 1-inch screen).....	30 pounds
Asphalt.....	42 pounds
TOP COURSE, PER BATCH	
Sand ($\frac{3}{8}$ -inch).....	348 pounds
No. 2 stone ($\frac{1}{2}$ -inch and retained on $\frac{3}{4}$ -inch screen).....	400 pounds
Asphalt.....	52 pounds

SPREADING THE BINDER COURSE

The Lakewood steel forms for the asphalt were set on the north side of the old concrete $3\frac{1}{2}$ inches off the edge of the slab to provide a rail for the finishing machine. Just inside the steel form 2 x 4's were set to grade and line with a notch in the wood on the side next the form for the flanged wheel of the finishing machine and for the rail pushed by the machine and

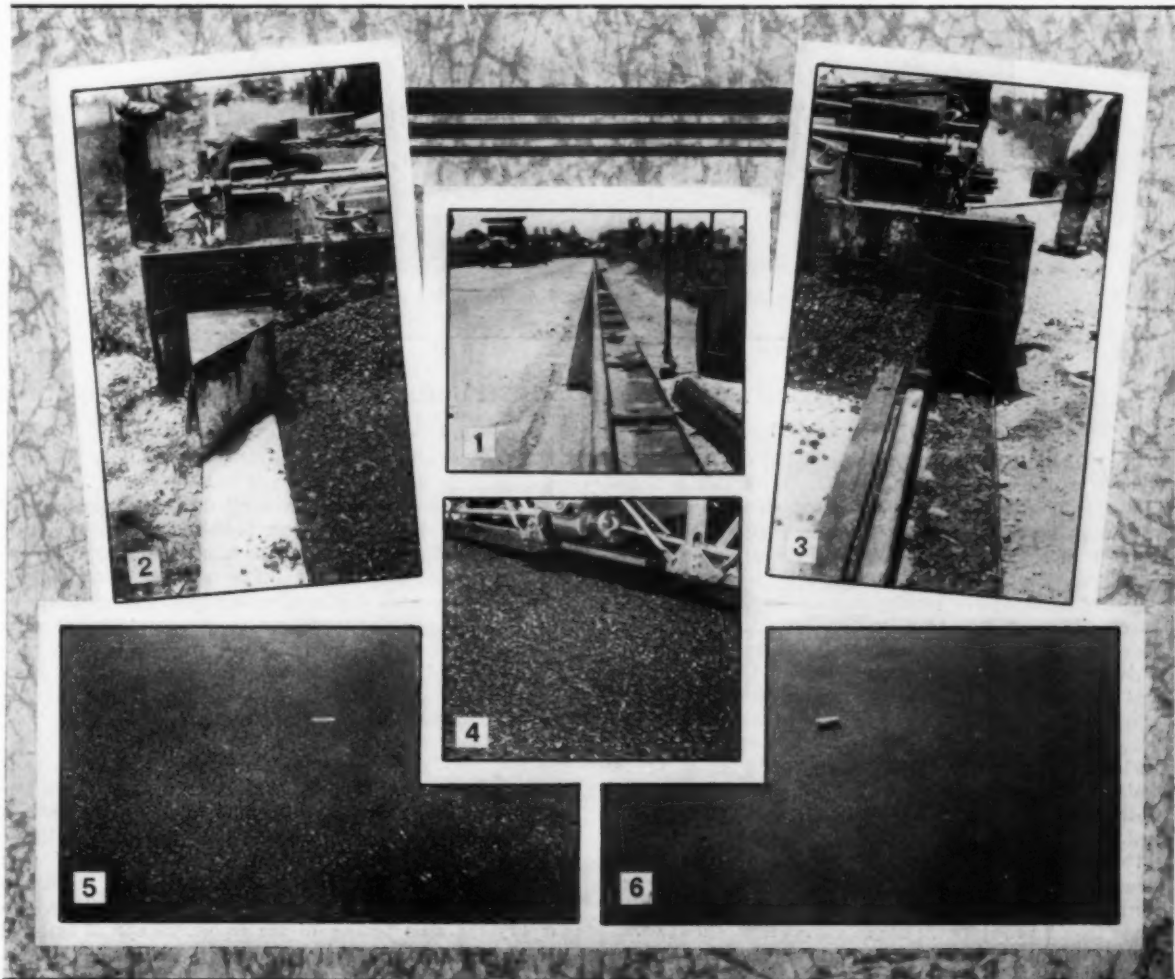
on which the screed slides. The initial wedge course of binder was rolled to form a firm base by an 8-ton Buffalo-Springfield steam roller. Both the binder and top course on this job were 1-inch thick as compacted with 10-ton tandem rollers.

The batch trucks turned where convenient and backed sometimes as much as $\frac{1}{4}$ -mile to the dumping board, which was of original construction. It was built of steel 10 feet wide and $5\frac{1}{2}$ feet deep with a plate of steel welded vertically in front to hold the material and prevent its falling forward when the truck dumped its batch in several installments. The front piece was 15 inches high so that it just cleared the tailboard of the truck when it was in maximum dumping position. A semi-circular hole 2 feet in diameter was cut in the back of the steel dumping board next the finishing machine so that if a man were caught between the screed and the dumping board he could step into the opening and not be crushed by the screed against the dumping board.

The asphalt crew consisted of one dump man, four shovelers, two rakers behind the screed to pull the

surplus material from the edges, one operator for the Lakewood asphalt finishing machine or screed, and a foreman. This outfit supplied with material by eight trucks regularly completed from 850 to 900 feet of pavement per working day. They worked two six-hour shifts a day between 7 A.M. to 7 P.M., giving the men the 30-hour week allowed by the Federal specifications as regards labor and still allowing for one day a week of bad weather or breakdowns.

The screed was set 1 inch lower when running base or binder than when running top. The left end of the screed, as seen when facing it from the front, carried a wedge-shaped scraper which ran along the form just ahead of the dolly on which the screed slid, to push off any aggregate or material which would cause the screed to rise and make an uneven place in the pavement. The dolly consisted of a plate carried by four rollers and on this the screed rode back and forth. It was lubricated frequently with crank case drainings to prevent any asphalt sticking between the two. On the right side of the screed a sliding dolly ran in the groove between the steel form and the 2 x 4.



DETAILS OF THE FINISHING MACHINE OPERATION ON THE REPUBLIC ASPHALT PAVING CO. CONTRACT

1. A view along the forms, showing one of the notched 2 x 4's to take care of the sliding dolly at the right end of the screed. 2. The left end of the screed showing the wedge-shaped scraper which cleared aggregate from the concrete curb. 3. The right end of the screed showing the dolly. 4. The binder course immediately behind the asphalt finishing machine and before rolling. 5. The binder course after rolling. 6. The top course immediately after rolling.

PAVEMENT CHECKED WITH A STRAIGHT-EDGE

Immediately back of the screed and after the rollers had completed the initial rolling, a checker with a 10-foot straight-edge went over every foot of the pavement and marked all high and low spots with yellow crayon for continued cross rolling until the uneven places were rolled out.

ACCESSORY EQUIPMENT

The contractor maintained a tank truck with a 750-gallon cylindrical steel tank for hauling water for the steam rollers, both for power and for the water for the rolls. The tank truck was equipped with a small

Lauson pump and engine for pumping the water from creeks and also for pumping to the rollers.

PERSONNEL

This resurfacing contract of the Republic Asphalt Paving Co. was in charge of F. S. Chamberlin as Superintendent. J. E. Conley is President and John H. Simpson is Secretary of the company. The work was done under the supervision of the State Highway Department, O. W. Merrell, Director, with Luke Brannon, Division Engineer, and R. S. Fisher, Assistant Division Engineer, in charge of construction. Matthew Boylan was Resident Engineer.



One of the Black-Top Gangs Posed on the Finishing Machine

Night Work on Roadway for Norris Dam

WORKING 320 men in three shifts, under floodlights and murky globes at night, W. W. Boxley & Co., of Roanoke, Va., is building at record speed a 4.8-mile heavy-duty highway from Coal Creek, Tenn., to the west abutment of Norris Dam on the Clinch River for the Tennessee Valley Authority.

Cutting through rocky mountainous territory, men with steam shovels and trucks have been working seven days a week since November 5 when the job started. It will be finished within 69 days after the execution of the contract. On December 15, 1933, grading of the highway was approximately 65 per cent complete and 6,000 feet of 11-foot wide paving had been laid. Heavy excavations on the new highway are numerous, but of the 190,000 cubic yards of earth and rock to be moved, 125,000 yards had already been handled on the above date, and approximately one-half the 550 cubic yards of concrete to be used in culverts had been laid.

The equipment on the job includes one paver, six shovels, twenty-five trucks, six steam rollers, eight tractors and bulldozers and two graders. Concrete already laid is being protected from freezing by the use of canvas frames under which lighted lanterns are placed at intervals. Because of the heavy traffic which will use the road, 450,000 pounds of steel reinforcing bar mats are being used.

When complete, the highway will connect the TVA railhead at Coal Creek with the dam site. Over it the heavy machinery and materials to be used in constructing the dam will be hauled. The road will be 22 feet wide and 8 inches thick.

Construction and Use of Corrugated Metal Pipe Culverts

TO point out the advantages and limitations of pipe culverts, how to design and construct them and how to obtain the best results with them at minimum cost is the purpose of a recent report published by the American Road Builders' Association on the construction and use of corrugated metal pipe culverts. The scope of this report is such that while most of it applies to all small drainage structures, it is directed particularly at corrugated metal pipe culverts.

With the aid of the data contained in this report, it is possible to determine the size of culvert needed at a particular location, and what grade and alignment are best for that location. A recommendation for minimum sizes is given. The next step is selecting the type of culvert and the particular material best suited to the conditions at hand. Then follows a complete set of instructions on how to install culverts of various sizes for various purposes and by various methods. Following a brief discussion of the various uses of pipe culverts, there is a discussion of the trends in use and design of pipe culverts, the practice of various road builders. To simplify the main portion of the report, all special material is confined to an appendix.

Road builders, whether engaged in the surveying, design, construction or maintenance of culverts on all types of roads and streets will find in this report the latest data in convenient form. Copies of this Bulletin No. 41 may be secured gratis from the American Road Builders' Association, National Press Building, Washington, D. C.



The Editor Comments

Another Code Starts a Fight

No sooner had the Mineral Aggregates Code, or officially, "The Code of Fair Competition for the Crushed-Stone, Sand-and-Gravel and Slag Industries", been signed by the President of the United States on November 11 than there began to rage a storm of protest over its monopolistic character. As this code seriously effects every contractor who has to purchase aggregates and apparently prohibits any expansion of the industry for several years to come in order that prices may be maintained, it is deserving of discussion.

After the usual statement of purposes, definitions and articles devoted to hours, wages and labor provisions, it arrives at the interesting set-up of administration and trade practices. This last contains in Section 5 a scheme for throttling competition that is far more drastic than other codes we have studied. As to the administration of the Aggregate Code: There are created District Committees presided over by Regional Committees of which there are sixteen governing an equal number of parcels of these United States. Then there are also created Standing Committees in each state for the purpose of surveying each state "to ascertain the available sources of supply of the products of these industries within the state, the capacity of existing production facilities and the relation between existing capacity and the actual and potential demand in such state." The report of this committee for each state effectively prevents any new capital starting a new quarry or sand pit by the mere statement that there is an ample supply of aggregate already in production by the existing stationary and portable producers. Thus unless someone has the finances and sales ability to show the regional committee that he can produce aggregate to satisfy a demand and can sell his product without injuring anyone within the "inner circle" the newcomer must remain out of business.

If this method is not completely monopolistic the hash is on us! Remember that this Code applies to those who are commercial producers of aggregate for sale to consumers. The Code at no point mentions definitely nor by inference that the contractor who is awarded a contract for grading a number of miles of highway and surfacing with gravel, crushed stone, mixed-in-place bituminous material involving the spreading of an aggregate, or a portland cement or bituminous concrete surface cannot produce the aggregate from a ledge on the right of way by means of a portable plant for his own use. It is reasonable to believe, however, that, armed with this formidable weapon known as a Code of Fair Practice, the signatories of the Aggre-

gate Code in the region or district where the contractor is operating will try, by every artifice known to the legal profession, to prevent the production of aggregate on the job and so perpetuate the monopoly.

If a contractor is not permitted to protect himself by producing a cheap and satisfactory aggregate on his own contract, he is at the mercy of the commercial producers in the district who, under the protection of their code, have prevented other competition. Hence, the contractor must pay their price or quit. Who will be the real sufferer? None other than the taxpayer who is paying the bill. The contractor, if not permitted to produce his own aggregate, will, under his code of fair practice, secure a price from the local producer and that must necessarily be his price for aggregate for the job. This will prevent the exercise of the ingenuity which is the stock in trade of the contractor. He bids a certain price because his brains and skill have been developed in his years of experience. He devises a way to set up a portable crusher that he has purchased, or has in mind to buy, that will enable him to furnish his own aggregate on the job with a minimum of overhead and no transportation charges and consequently at a cost far below the prices of the producers of the district who have joined to stifle competition. We have described many contracts in these pages where the contractor produced his own aggregate. One of the most recent jobs visited provides an outstanding example. A cut at the middle of a large grading and paving contract contained some particularly fine trap rock. The contractor left this trap rock cut until the last and even hauled other poorer quality rock over the hump to complete the fill. He installed a small crushing plant, and when the ledge was removed it was hauled a minimum distance to the primary crusher and stockpiled immediately beyond the secondary crusher at the middle of the job for easy rehandling to the batcher at a cost far below the delivered price of available commercially produced aggregate. Can anyone maintain with any degree of justice that the contractor should have wasted the excellent trap rock ledge and purchased the aggregate from a commercial plant from which it would have had to be shipped by freight or trucked many miles to the batching plant from the quarry?

Codes have done much good in the development of fair play in many industries, but it seems that under the cloak of "fair competition" some of our friends are hitting below the belt.

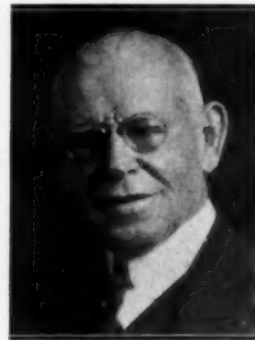
Theodore Reed Kendall



H. C. Whitehurst
Director of Highways, D. C.
President, A.R.B.A.



Charles M. Upham
Secy. and Engineer-Director
A.R.B.A.



James H. MacDonald
Consulting Highway Engineer
Treasurer, A.R.B.A.

Executive Officers
American Road Builders' Association
Manufacturers' Division, A. R. B. A.
Associated Equipment Distributors

A. R. B. A. Annual Convention
and Highway Exhibit
Chicago, January 22-26, 1934



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McGraw-Hill Pub. Co.
President, Mfrs. Div., A.R.B.A.



Chauncey B. Smythe
Thew Shovel Co.
Vice-Pres., Mfrs. Div., A.R.B.A.



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Smith Booth Usher Co.
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Robert R. Nixon
Nixon-Hasselle Co.
1st Vice-Pres., A. E. D.



A. C. Blaisdell
Queen City Supply Co.
Secy. & Treas., A. E. D.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

It Was Not a "Cold Day" for Contractors When Pipe Froze and Burst

"Replace the pipe that burst, at your own expense," demanded a Pennsylvania city when a water line across a bridge froze and burst after the contract under which it had been laid had been substantially completed.

"We will comply with your demand to repair the line, but in due course you'll get our claim for this extra expense," replied the contractor.

Before the freezing occurred, the contractor had substantially completed the job and there had been an inspection, but it was agreed that final acceptance of the work should be deferred until spring. There was slight leakage to be repaired, painting to be done, etc., and \$350 was retained from the contract price to cover this, as well as a percentage of estimates paid, as called for by the contract. The pipe line was put into service and froze while being used by the city.

The supervising engineers, who were made arbiters of disputes under the contract, certified that the contractor was entitled to compensation, under an extra work clause of the contract, on a basis of cost plus 15 per cent. The city refused to pay and the contractor sued.

The Pennsylvania Supreme Court decided (*Jackson v. City of McKeesport*, 157 Atl. 472) that the engineers were justified in including the cost of replacements in their final estimate, and that the city was bound to pay it.

Excavating Contractor Does Not Assume Difficulties Resulting from Concealed Artificial Obstructions

"When you invited bids for the excavation of the site on which you were to erect an office building, you concealed the fact that there was a buried swimming pool on the lot," complained a subcontracting company. "We knew that the general nature of the soil in the locality was such that it could probably be removed by a steam shovel. But because the swimming pool was constructed of concrete and marble, it cost us nearly \$1,000 more to do the job than it would have cost had the soil been in its natural condition. We want damages."

The owner had a notion that the subcontractor was bound to either appraise himself as to what lay below the surface of the lot or take his chances. The circuit court in Louisville backed the owner up in this contention, but the subcontractor won an appeal to the Kentucky Court of Appeals. In an opinion filed February 10, 1931, in the case of *Highland Motor Transfer Co. v. Heyburn Building Co.*, 35 S. W. 2d 521, the higher court said:

"Where a contractor undertakes to excavate a lot his contract is known as a 'chancing' contract, but that rule applies only in cases where the difficulties encountered are natural and could not reasonably have been anticipated by either of the parties to the contract. If the natural formations are different from what was expected by the contractor, he cannot claim extra compensation because of the increased cost of doing the work. But we find no case applying the rule where there is an artificial obstruction concealed under ground which was known to the owner and unknown to the other

parties. Here we have hidden concrete and marble well concealed by the surface of the lot, and that surface . . . which concealed the obstruction had been made by the owner.

"If appellant [the contractor] visited the lot and made an inspection, as he alleged in his petition, he found a lot apparently in its natural state. There was nothing to indicate the hidden obstruction. He was within his rights in assuming that the work of excavating would be determined by the character of material which had been placed under the lot by nature. The provision in the specifications that the contractor should remove from the premises all surplus excavated material and debris did not put him on notice that there would be any such to be removed except that which was created by the work which he did in carrying out the contract.

"It is further contended that it was generally known in the neighborhood that the swimming pool had existed, and that the old building had been removed, and that the swimming pool had been filled up. That is a matter of defense. If it should be established that appellant knew the condition, or by the exercise of ordinary care should have known it, it could not claim that it had been deceived in the making of the contract."

Crediting a Payment When a Debtor Owes Several Items

"Please apply enclosed check in payment for materials furnished by you for the Jones job." Something like that is what a contractor should write a materialman when a payment made is not large enough to cover all the items that the contractor owes to the same creditor.

If the money used to make the payment was furnished by Jones, the contractor should see that Jones is protected against the filing of a lien claim for materials.

But, even when circumstances do not require protection of the interests of any third person, the contractor, like any other debtor, has a right to dictate to the creditor materialman the particular debts that are to be credited by a payment.

In an opinion rendered by the Rhode Island Supreme Court June 12, 1931, in the case of *Albert S. Eastwood Lumber Co. v. Britto*, 155 Atl. 354, the following general rule of law was recognized:

"The debtor may direct the application of a payment on account, but in the absence of such direction or a manifestation of intent that the payment shall be applied in a particular manner, the creditor may apply such payment in the order which he may consider most advantageous to himself."

This statement seems to presuppose that no information has come to the materialman that money used by the contractor came from any particular source. It now appears to be generally recognized by the courts that a materialman is bound to credit a lienable account, in favor of an owner, if the materialman knows money paid by a contractor on account was paid to him by that owner.

In the Rhode Island case, there was a dispute as to whether or not the contractor had directed the materialman to credit a certain account. Manifestly, such a dispute could not have arisen had the contractor made the direction in writing and kept a copy of it.

Construction Industry News

Clifford F. Messinger, President of the Chain Belt Co., died suddenly at his home in Milwaukee on December 12, 1933. Mr. Messinger, who was a graduate of Sheffield Scientific School, Yale University, had been associated with the Chain Belt Co. since his graduation in 1911. In 1913 he became advertising manager and then successively sales manager, general manager, vice-president and president, having been elected to that office in 1930. Mr. Messinger was active in a number of trade associations, having been at one time president of the Mixer Manufacturers Bureau and chairman of the Malleable Chain and Manufacturers Institute.

Caterpillar Tractor Co., Peoria, Ill., has announced that **H. P. Mee**, Vice-President and Treasurer, will be in charge of sales for that company after January 1, 1934, at which date **George L. Bell**, at present Vice-President in charge of sales, will resign to become Executive Director of the Men's Clothing Manufacturing Industry. **H. M. Hale**, who has been with the company since 1923, has been elected Treasurer. **D. A. Robison** has been elected an Assistant Treasurer.

American Society for Testing Materials, Philadelphia, Penna., has moved its headquarters from the Engineers Club Building, 1315 Spruce Street, where they have been located for the past 14 years, to larger and more adequate offices in the Atlantic Building, 260 So. Broad Street, Philadelphia.

International Harvester Co., Chicago, Illinois, recently has announced the election of **Addis E. McKinstry** to succeed the late **Alexander Legge** as President of the company. Mr. McKinstry joined the Deering Harvester Co. in 1886, holding a number of positions in that company. In 1903, the year after the formation of the International Harvester Co., he was given charge of Canadian Sales. Since that time he has held several important offices in the company, having been elected Vice-President in charge of sales in 1919, a director in 1925 and in 1932, First Vice-President.

Independent Pneumatic Tool Co., Chicago, Ill., has announced the appointment of **W. A. Nugent** as Sales Manager. Mr. Nugent, who was formerly District Manager of the Chicago Territory, has been with the company 19 years and over this period has served as St. Louis Branch Manager, as Assistant to the President and in similar capacities. Mr. Nugent took over his duties on December 1 and was actively put in charge of all pneumatic and electric tool sales.

Ohio Power Shovel Co., Lima, Ohio, has announced the appointment of the **Allied Equipment Co.**, Oklahoma City, Okla., as distributor for Lima excavators, including a complete line of shovels, cranes and draglines in $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$ and $1\frac{3}{4}$ -yard capacities. The **Brown-Bevis Equipment Co.**, Los Angeles, Calif., successor to the **Brown-Bevis Co.**, has also recently been appointed distributor for Lima excavators.

Leipzig Trade Fair, Inc., 10 E. 40th St., New York City, American representatives of the Leipzig Spring Fair to be held in Leipzig, Germany, March 4-11, 1934, has announced that this year's Fair will have over 7,000 exhibits, an increase of 15 per cent over last year.

A Transparent Cure for Concrete Pavements

PRACTICALLY all of the methods of curing concrete pavements have certain disadvantages and some highway engineers have expressed a desire for a curing medium that leaves the surface of the concrete in its original form with no discoloration and yet which will adequately protect the concrete against evaporation during the period of hydration. **Ritecure**, a new material developed by **The Johnson-March Corp.**, 29-28 Hunter Ave., Long Island City, N. Y., is transparent, does not combine with the concrete surface nor stain or change its physical appearance. It has sufficient elasticity to bridge any cracks or fractures due to displacement or settlement. **Ritecure** is supplied in the form of a milky white liquid with a viscosity only slightly greater than water. When sprayed on the green concrete, it has the appearance of white paint. Although the finished material is transparent, it is essential that a color be present during the application in order that the operator and inspectors may see that the surface to be treated is adequately covered. The color starts to dissipate within ten or fifteen minutes depending on the temperature and humidity and disappears entirely within a few hours, leaving the surface of the concrete covered with a transparent flexible membrane or film which is impervious to water and is not affected by the action of the elements.

A waterproofing medium and a concrete cure is a form of waterproofing that prevents evaporation rather than absorption, to be fully efficient must have the ability to adhere to vertical surfaces. **Ritecure** will adhere either to vertical or horizontal surfaces with equal facility. It is sprayed by means of a single nozzle pressure spray outfit at the rate of approximately 40 square yards per gallon of material. Whether the concrete has a troweled finish or is roughened with a broom or screed, every portion is protected by a flexible film and as the concrete expands or contracts the film moves with it. Although it is in close contact with the surface, following every inequality of the surface, it makes no combination with the concrete, and after a few weeks forms a tough varnish-like finish. In the case of pavement slab, when the curing period ends and traffic is admitted, the film gradually wears off under the grinding of the automobile tires. The treated surface is claimed to have better tractive qualities than the plain surface, and tends to resist skidding.

Test sections have been satisfactorily completed on concrete highways in New York, New Jersey, Massachusetts and Maine and on the paving in the **Babor-Comeau** contract for the New York Central Railroad at the foot of West 60th St., New York.

New Specifications for Steel for Bridges, Buildings and Mild Steel Plates

ON the recommendation of its Committee A-1 on Steel, the American Society for Testing Materials has approved for publication as tentative three new specifications covering steel for bridges, steel for buildings and mild steel plates.

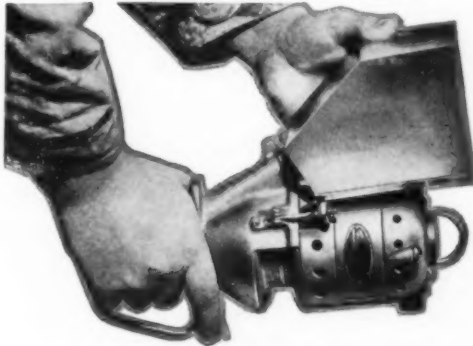
The new specifications for bridge and building steel call for the 60,000 to 72,000 tensile strength grade of steel. They follow in general the requirements given in the medium structural steel specifications issued last year, now withdrawn, while the specifications for mild steel plates supply a grade of steel comparable to the existing standard structural grade. There are, however, a number of changes in the new specifications, among which is the number of tests required. Each of the new specifications also includes a table of permissible variations over ordered thickness, of plates over 2 inches in thickness.

Copies of these new specifications may be secured from the American Society for testing Materials, 260 S. Broad St., Philadelphia, Pa.

An Airless Painting Machine

A SELF-CONTAINED electrical unit utilizing centrifugal force rather than the customary air pressure method in applying paint has been developed by the Electrical Painting Equipment Co., Inc., 247 Park Ave., New York City. This Norris electrical painting machine forces the paint out in an even, fan-shaped spray which, by instantaneous adjustment of the distributor, may be varied from less than $\frac{1}{2}$ -inch to 18 inches in width. The cut-off on all four sides can be held sharp at the option of the operator, making it possible to paint up to door frames and base-boards with great accuracy and without spattering.

The consumption of paint can be regulated to the necessary quantity by means of a paint control valve at the base of the machine. This control allows a one or two-coat finish as the case demands and prevents waste of material. The manufacturer claims that the elimination of the use of air does away with the paint fog which endangers the health of the operator. Aside from general painting and maintenance work, this machine may be used effectively for commercial painting and for the application of rubber solution to fabrics for waterproofing and similar work.



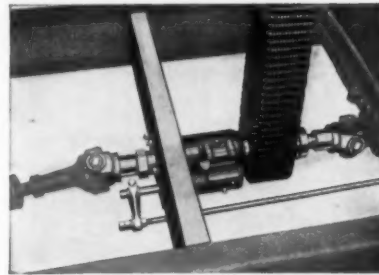
The Norris Electrical Painting Machine

A New Distillate Engine for Shovel and Dragline Service

AN engine that burns the lighter distillate sold in different parts of the country under names such as No. 1 furnace oil, No. 1 engine distillate, No. 1 stove oil, tractor distillate, etc., has been announced by Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill. It is claimed that this new Northwest engine is as simple as a gasoline engine and can be understood by any shovel, crane or dragline operator. There are no moving parts other than those found on a gasoline engine, and the pressures do not exceed those of a gasoline engine. Further, it can be started by cranking.

The operating principles are the same as a gasoline engine, including an ignition system and carburetor. Due to the special combustion chamber design and correct manifold, the heavy oil reaches the cylinder in practically the same condition as does gasoline. The fuel conversion system meters the fuel accurately to the engine and atomizes it finely into the air stream. It distributes it uniformly to each of the four cylinders and prepares it for complete, clean combustion.

The Northwest oil engine is of the heavy-duty type and operates at slow speed which gives torque characteristics and hanging-on qualities that meet the dragdown loads of shovel, crane and dragline operation.



A Dittwiler Power Take-Off Installation

A Split-Shaft Power Take-off for Motor Trucks

THE Schultze split-shaft power take-off for motor trucks, which has been made for several years by the Schultze Mfg. Co. of Bloomington, Ill., was recently acquired by the Dittwiler Mfg. Co. of Galion, Ohio, and is now being marketed by them in improved form. This Dittwiler power take-off is installed by removing a section of the drive-shaft of the truck and replacing it with the take-off device. This does not interfere with the ordinary operation of the truck.

By shifting a lever at the driver's seat, the entire power and speed of the motor can be utilized from the take-off, which is made in two types: No. 700 is a direct power take-off and is used with equipment mounted on the truck while No. 800 delivers the power at either side of the truck by means of a shaft at right angles to the drive-shaft. This Dittwiler take-off is primarily used to operate all types of portable equipment such as air compressors, electric welders, water pumps, hammer mills, portable saws and similar equipment.

Silicosis

IN view of the increasing prominence given to the effects of silica dust on the health of workers, the Industrial Health Section of the Metropolitan Life Insurance Co. has prepared a booklet entitled "Silicosis" for the information of superintendents and foremen on work where silica dust is encountered. The booklet contains a brief description of the disease, its causes and complications, and a more detailed discussion of measures designed to prevent its occurrence.

A limited number of copies of this booklet are available for readers of *CONTRACTORS AND ENGINEERS MONTHLY*. Requests should be addressed to the Industrial Health Section, Metropolitan Life Insurance Co., One Madison Ave., New York.



A Caterpillar Diesel Seventy-Five Pulling a Shaw Scraper on a Project of Willis Rowe, Contractor, of Bloomington, Ill., Rebuilding State Aid Roads and Diverting a Creek Channel



Munsell Vibrators in Use on the Peter di Antonio Concrete Paving Contract for the New Jersey State Highway Department in Trenton, N. J.

A New Vibrator for Concrete Paving

THE adapting of Munsell concrete vibrators to concrete paving has provided an economical method of compacting the concrete in the slab, as suggested in a recent report of the U. S. Bureau of Public Roads on this subject. Two vibrators made by Munsell Concrete Vibrators, 995 West Side Ave., Jersey City, N. J., are mounted on an 8-inch channel screed board which carries a pair of rollers at the front edge to hold the screed about $\frac{3}{4}$ -inch above the forms and permitting that much more concrete to be consolidated in the depth of the slab. The accompanying photograph shows the finish of the surface behind the screed and the stiff consistency of the concrete is evidenced by the man in rubber boots who is standing in the un-screeded concrete and sinking not deeper than the soles of his boots.

It is reported that the New Jersey Highway Commission is the first to require the use of vibrators on its concrete paving although experimental work has been done by the State Highway Departments of Missouri and Illinois. At present one of the Munsell vibrating screed boards is in operation at the traffic circle of New Jersey Route 21, 25 and 29 at the Newark Airport, being used by the Franklin Contracting Co.

A New Double-Drum Power Control Unit

A NEW and improved double-drum power control unit has recently been announced by R. G. Le Tourneau, Inc., Wilson Way at Roosevelt, Stockton, Calif. This new unit carries more than twice the amount of line and has more than twice the amount of pulling power than the older unit. It also has the lead sheaves above the drums instead of below, and has fairleads on both lines so they can be led in any direction.

This unit is designed for the operation of Le Tourneau scrapers and tractor derricks. It is also applicable for the operation of any other equipment requiring two lines and, by leaving one line idle, for the operation of bulldozers, Angle-dozers, rooters or other equipment requiring but a single line for operation. It will also operate a bulldozer or Angledozer and cowdozer on the same tractor, one line for each, or a bulldozer and dump cart on the same tractor, one line for each.

The drums on this unit are 8 inches in diameter and 8 inches long, with flanges 13 inches in diameter. The sheaves are 9 inches and the weight of the plain power unit is 1,000 pounds. It has a line pull, with a bare drum, of 9,405 pounds and with a full drum, 5,824 pounds. The line speed, with a bare drum, is 200 feet per minute and with a full drum, 325 feet per minute.

As in the former type control unit, one lever controls each drum. Pulling it one way releases the drum and allows the

line to run out; pulling it the other way actuates the drum and reels in the line; and releasing the lever locks the drum. The tractor operator can readily control both drums. Timken bearings and alloy steel gears are used.

A New Gall-Proof High-Temperature Lubricant for Threads

A NEW metallic lead thread lubricant, suitable for use on heavy-duty machinery, has recently been announced by the Armit Laboratories, 1900 East 65th St., Los Angeles, Calif. This lubricant is designed for use in the assembly of machinery and in the maintenance and repair of equipment which is subjected to heavy duty, high temperatures and general abuse.

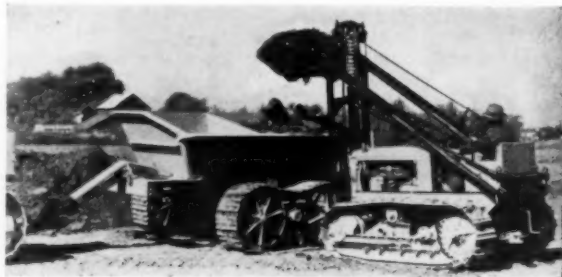
It is a very finely divided metallic lead in paste form which forms a film of metallic lead between threads which prevents galling, speeds up work and cuts maintenance and repair costs. Stud bolts on the heads and exhaust manifolds will not freeze, nor will pipe threads corrode together, as the lead does not oxidize or harden. High temperatures do not destroy or harden this compound, making it suitable for exhaust studs. It is also claimed that its use on liners and flywheels facilitates their insertion or removal.

Arrangements are now being made for the sale of this lubricant nationally through distributors.

A New Front-End Shovel Loader

A HANDY tool which is not new to the construction industry but which contains new features has been announced jointly by the Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wis., and Frank G. Hough Co., 919 N. Michigan Ave., Chicago, Ill. This new front-end shovel loader, manufactured by Frank G. Hough Co., is mounted on an A-C Model M tractor which is equipped with a wide-gage long track and the truck frames are rigidly mounted to eliminate all oscillation. This makes it possible to mount the loader more solidly. All thrusts are taken on heavy channels supported on the long truck frame. There are five truck rollers per track which materially spreads the weight of the loader.

There are many uses for the loader in both the municipal and contracting fields. At a recent working test, this equipment opened a new gravel pit and loaded to trucks an average of 32 cubic yards per hour. The standard $1\frac{1}{3}$ -yard bucket can be removed and a bulldozer blade installed, or a larger bucket can be used for handling snow and other light material. The unit is hydraulically controlled and is completely equipped with counterweights and a rear starting crank. The drawbar is clear for use on any pulling work.



A New Front-End Tractor-Mounted Shovel Loader

For profits on any job—at night—use NATIONAL CARBIDE V-G LIGHTS

Winter Work means *SHORT DAYS* and *LONG NIGHTS* with a need for economical light.



Y-199



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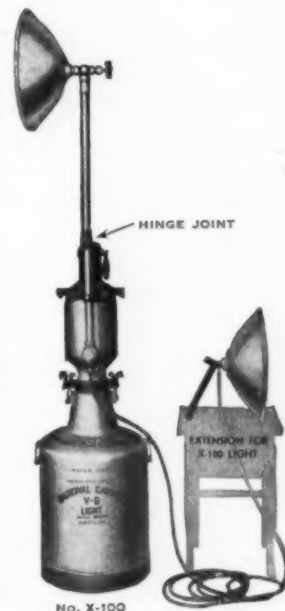


NATIONAL CARBIDE—the nearest approach to sunlight known—is available everywhere—always packed in the red drum—with National Carbide warehouses and distributors from coast to coast.

THE NATIONAL CARBIDE V-G LIGHT (illustrated at right) spreads a full, even beam of about 8000 candlepower right where you need it, giving ample clear, steady light for about twelve hours on one 7-pound charge of National 14-ND Carbide and 7 gallons of water. Weighing 35 pounds empty, 98 pounds when full, it is easily handled by one man. No harm done if it tips over:—simply stand it up again, and it goes right on working. The reflector standpipe may be tilted to any angle.

THE NATIONAL CARBIDE V-G HANDY LIGHT illustrated at the left is a smaller size, consisting of a tank holding 2 gallons of water, a hopper containing a 13/4-pound charge of National 14-ND Carbide and the feeding device. It runs for about five and one-half hours on one charge, and delivers about 1500 candlepower. Weighing only 37 pounds when charged, it is a most handy light for emergencies because it is so easily carried around. Reflector tilts to any angle.

THE NATIONAL CARBIDE LANTERN (at left) is the nearest approach to daylight ever found in a lantern—giving ten times more light than an oil lantern, and at less cost. It burns eight hours on a single 8-ounce charge of carbide and one filling of the water chamber. A brilliant rear signal of red, blue or green is supplied without extra cost.

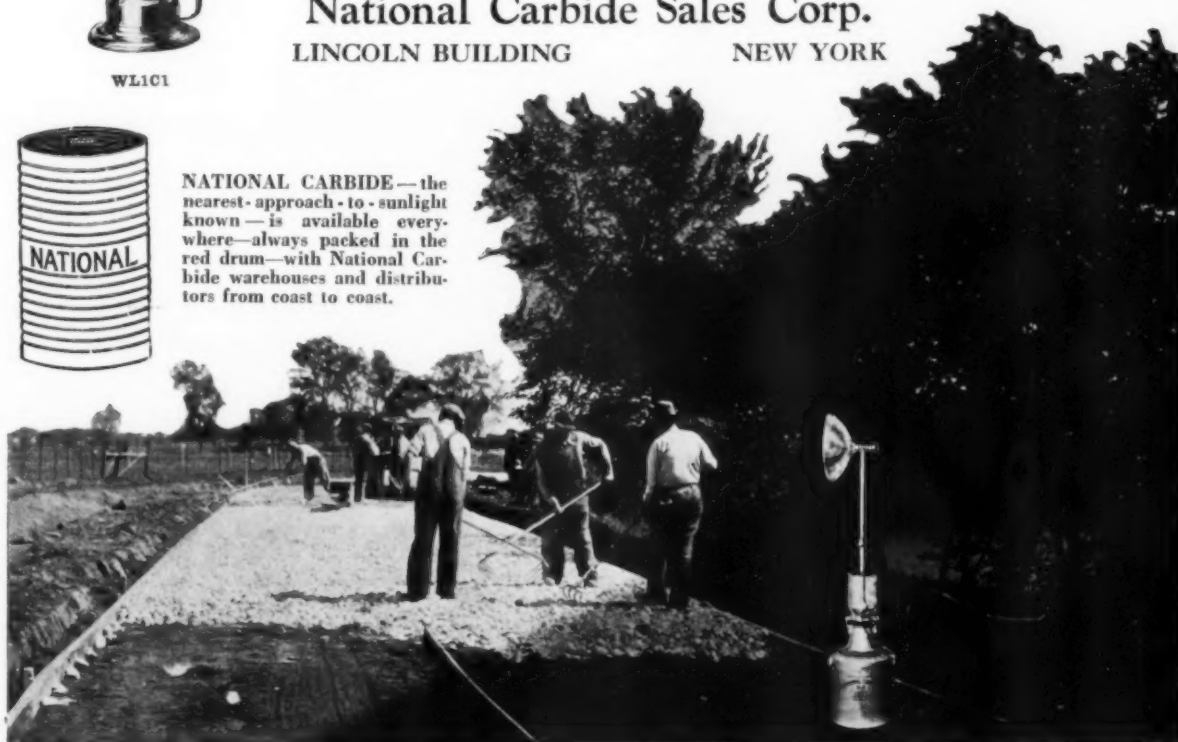


No. X-100

National Carbide Sales Corp.

LINCOLN BUILDING

NEW YORK



Do you mention CONTRACTORS AND ENGINEERS MONTHLY when writing? Please do.



The Littleford Oil-Burning Salamander

Heating Equipment Necessary to Winter Construction

THE NRA plans to push construction projects right through the winter months. PWA is following up closely. As a result, all contractors awarded work are interested in heating equipment. Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio, manufactures an oil-burning salamander that is used for both outside and inside heating. The advantages of this outfit are that it is troubleproof, entirely free of smoke and ashes and burns kerosene, thereby eliminating the more expensive bulky fuel. There is no intense heat directly under the salamander, and the hood distributes the heat uniformly over a large area. One man can keep practically any number of oil-burning salamanders going. All that he has to do is occasionally give the pump on the fuel tank a few strokes to maintain the proper pressure.

The L-B salamander consists of an oil burner, flame deflector, hood, stand and fuel tank. It can be easily moved from place to place when in operation or knocked down and conveniently stored in small space when not in use. The fuel tank and burner can be removed and used for any kind of heating, thawing or drying.

Other modern equipment made by Littleford Bros. for winter construction are concrete heaters, water heaters and oil burners. Winter concrete construction can be carried on with safety at a very low additional cost when the proper equipment is used.

A New Hydraulic Bulldozer

A NEW and simplified bulldozer, weighing 1,800 pounds and capable of resisting great strain, has recently been announced by the Austin-Western Road Machinery Co., 400 No. Michigan Ave., Chicago, Ill. This bulldozer, which has a high lift and very low undercut, is designed for use with a Cletrac 35 trailer. It is simple to attach and may be removed or replaced quickly and easily. The adaptability of the tractor is in no way impaired by the mounting of the bulldozer, turning clearances are not restricted and the oil pump is mounted out of the way behind the driver's seat in



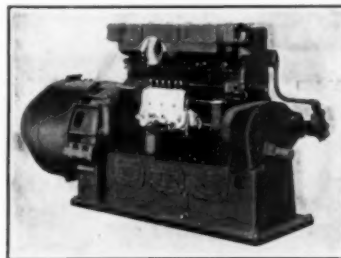
A New Hydraulic Bulldozer

the position of the power take-off.

The blade can be raised or lowered to any position and held rigidly or it can be allowed to float. The tilt of the blade can also be varied. A gear pump provides smooth, positive manipulation and pressure is applied to the blade in both directions. The lever-operating four-way valve provides fingertip control. The heavily-reinforced blade rolls material instead of pushing a dead load ahead. The high carbon steel bit is reversible to provide double wear. The shoes of wear-resisting alloy-steel have replaceable soles.

A New Light Compact Diesel Generating Set

THE increasing electrical power rates in isolated communities and the need of dependable power on many construction projects has led the Buda Co., Harvey, Ill., to develop a new light compact diesel generating set producing current at approximately $\frac{3}{4}$ to 1 cent per kilowatt. These sets range in size from 10 to 90 kilowatts in both alternating and direct current. The engines do not require the services of an attendant, only an occasional visit to the engine room possibly two or three times a day. They are suitable for twenty-four-hour service.



The New Buda-M.A.N. Diesel Generating Set

The Buda-M.A.N. is a full diesel engine operating on a four-stroke cycle. It is of compressorless construction with the fuel injected into the cylinders without the aid of compressed air. The omission of a compressor simplifies the operation and servicing. Electric starting equipment is provided and a governor as well as a manual regulator make it possible to maintain extremely close speed regulation so that variations in load do not affect the voltage of the 24-volt generator.

A Gravity Dump Truck

A GRAVITY dump truck which has a capacity of 4,000 pounds and which has a height to the top of about 50 inches, when the body is lowered, making it practical for hand loading, has been announced by the Howell Industrial Truck Co., 6545 Carnegie Ave., Cleveland, Ohio, for contractors. This Type 7 gravity dump truck has a width of 55½ inches when equipped with single tires, 69½ inches when equipped with dual tires and weighs complete 3,390 pounds. The body can be constructed so that it is water-tight and it readily carries cement, sand and other loose fine material.

The body is dumped by the operator kicking over a lever with his left foot. A stiffling with a spring to absorb the shock holds the body in the dump position until the operator kicks his foot against the lever again when the body is returned to the down position. The dumping angle is 45 degrees. The body is made in capacities of 1, 1½ or 2 cubic yards and a side-dump body can be furnished which will dump to either side or to one side as desired. The speed of the truck unit is from a mere crawl to 45 miles per hour.



You're Right ...It's a GALION

So it is—wherever you go you'll find a Galion Grader on most of those tough jobs.

Galion Leaning-Wheel Graders—with Hydraulic or E-Z Lift Manual operation—are known for their unequalled performance in building new roads and maintaining existing roads. There is a type and size to meet your requirements.

Write your nearest Galion Distributor—there is one near you—or simply write to:

The Galion Iron Works & Mfg. Co.
Galion Ohio

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*The Various Types of
Rawldrills*

A Three-Point Masonry Drill

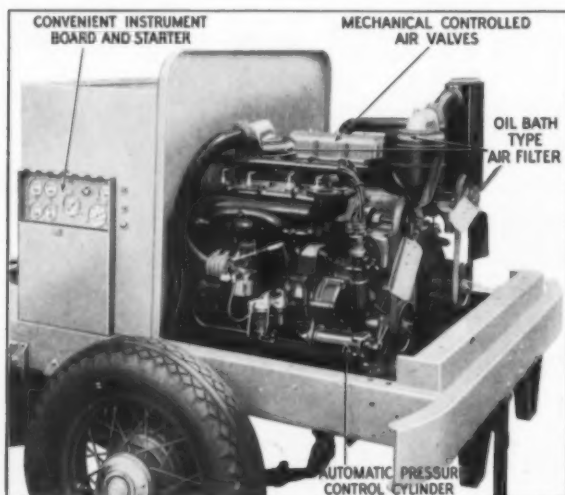
A NEW masonry drill, known as the Rawldrill, the three-point construction of which is claimed to have several advantages, has recently been announced by the Rawlplug Co., Inc., 98 Lafayette St., New York, N. Y. These drills are hand-forged from the best quality tool steel to commercial standards for masonry drills and are heat-treated and tempered to give maximum service. They are made in several types for both hand and power drilling, in sizes $\frac{3}{8}$ to $1\frac{1}{4}$ inches in diameter, and also in different lengths.

Among the features of this new drill is the fact that re-sharpening of the drill on any grinding wheel is possible right on the job; it has long life because it will drill clean, accurate holes until it is worn down to the shank; and the straight parallel sides of the cutting lips are designed to insure an accurate hole, as well as to reduce drill breakage.

A Trailer-Type Portable Air Compressor

A REALLY portable compressor, for use in the construction industry, consisting of a special four-cylinder air compressor, V-belt driven by a Chrysler four-cylinder industrial engine, has been announced by Amplex Manufacturing Co., 7900 Joseph Campau Ave., Detroit, Mich. The unit has two radiators, air tank and accessories mounted on a rigid frame, spring suspended and carried on two pneumatic-tired wheels with two separate cooling systems, one for the engine and one for the compressor. No heat from one unit is carried by the water to the other unit and greater cooling during compression of the air results, producing cooler discharge air temperatures and less possibility of the formation of carbon on valves and valve seats.

An air intake silencer effectively reduces the pulsating noise of the intake air. The silencer together with the muffler on



The Left-Hand Side of the Chrysler Compressor Unit

the engine results in very quiet operation of the compressor. Mechanical control of the air valves gives high volumetric efficiency. By using mechanical opening and closing on the inlet valve, and automatic opening and mechanical closing on the discharge valve, a positive control on the valve action is assured.

The automatic pressure control cylinder is so designed that the speed of the engine is regulated to the demand for air. As air tools are added to or taken off the air line, the speed of the engine increases or decreases to give the desired amount of air required by these tools. The unit is 104 inches long, 70 inches wide, 60 inches high and weighs 2,440 lbs.

Traction Treads for Dual-Pneumatic Tired Equipment

WARCO J. & S. traction treads which are designed for use with dual-pneumatic tired equipment to give added traction in mud, sand, snow and ice, have recently been announced by the W. A. Riddell Co., Bucyrus, Ohio. While it is generally conceded that dual-pneumatic tired



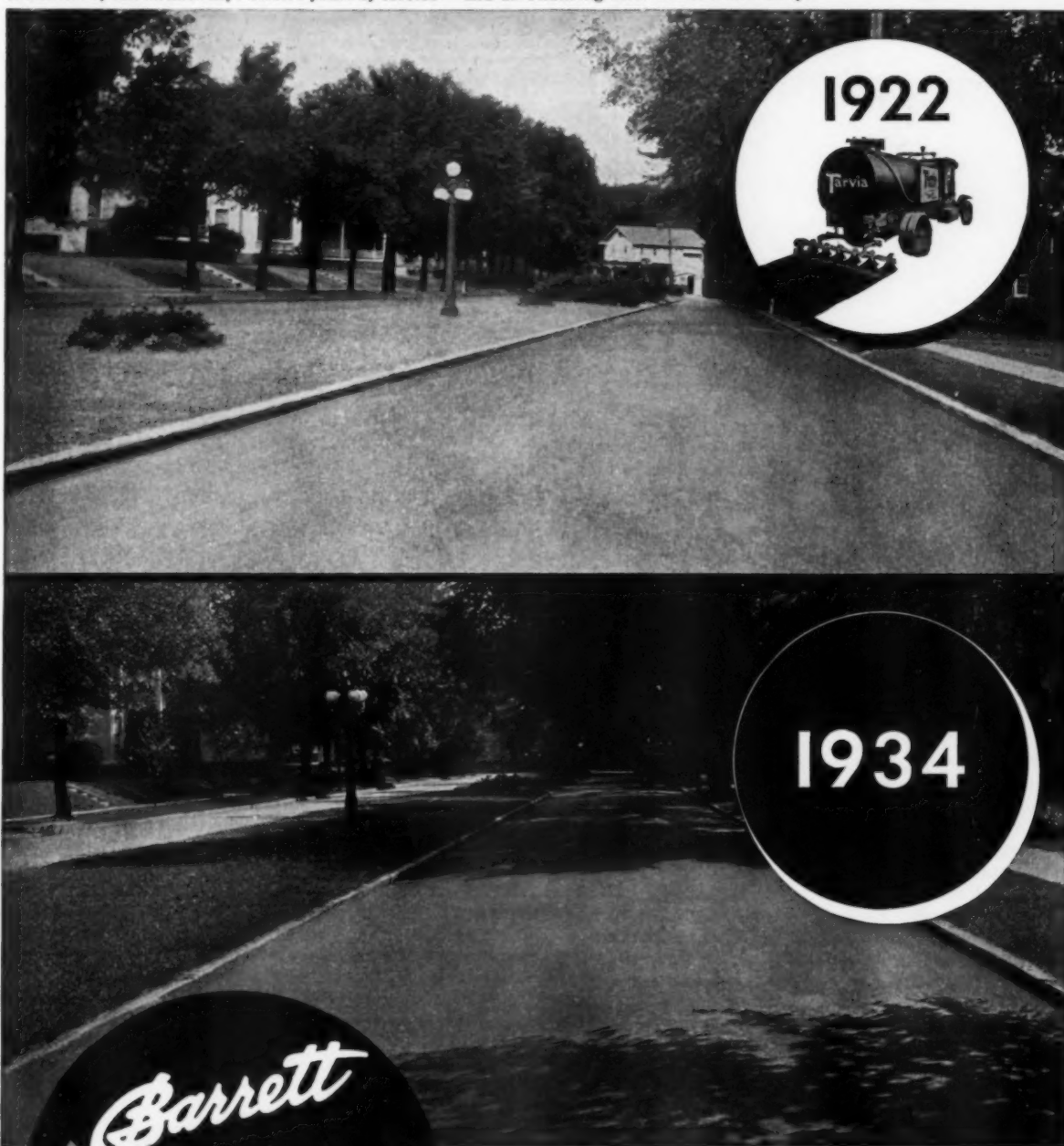
*Warco J. & S. Traction Treads for
Pneumatic-Tired Equipment*

wheels give excellent traction where the footing is solid or the going good, there are many ground conditions in which construction equipment of various kinds are required to work where the wheels skid or spin. It is for such conditions that the J. & S. traction treads are designed.

The materials used in these treads are of the best obtainable. The wearing shoes, links and pins are of 40-50 high-carbon heat-treated steel castings. The pins are large and easily removed by the simple method of removing one keeper pin. The treads are adjustable, having a self-locking toggle clamp with turnbuckle adjustment for compensating tire wear and to provide for variation in tire sizes. The inside of the tread plates is a smooth surface slightly curved to fit the contour of the tire and is so designed that the plates do not mar or injure the tire in any way. The treads are held against the tire with sufficient tension to prevent chafing or slipping. Detachable lugs or grouters can be quickly and easily attached for use when needed in extreme conditions.

These treads can be used on tractors, motor graders, wagons, dump trucks and dual-pneumatic tired trucks when traveling over soft, loose or freshly graded earth or on highways when they are covered with ice or snow.

Franklin Place, Rockford, Ill., was Tarvia-built in 1922. Top photo was taken shortly after construction; lower photo shows condition of the road today. Twelve years of service—and an enduring asset to the community.



Tarvia qualifies for all types of emergency highway work authorized by the Federal Government. Whether it is a back country route to surface or widen, or a new modern, skid-safe trunk-line highway to build or maintain there is a right type and right price Tarvia for the job. Tarvia construction and maintenance are speedy and inexpensive, and local labor and materials may be used. Ask the Tarvia field man.

Meet us at Booth 136, Annual Meeting of American Road Builders Association, Stevens Hotel, Chicago, January 22-25, 1934.

THE BARRETT COMPANY

New York Chicago Philadelphia St. Louis Minneapolis
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Please mention CONTRACTORS AND ENGINEERS MONTHLY—it helps.



The New Cletrac Diesel 80

A New Diesel Crawler Tractor

A DIESEL crawler tractor in the 80-hp class which develops 85 hp in second gear has been announced by the Cleveland Tractor Co., Cleveland, Ohio. Other than the engine, the Cletrac diesel has the same specifications as the gasoline-powered Cletrac 80.

The heavy weight per horsepower of diesel engines has been one of the chief objections which has retarded their use as power units for tractors but this objection is claimed to have been largely overcome in the Cletrac diesel. The development of a satisfactory starting device has always been a problem which also handicapped the use of diesel engines for mobile power units. The high compression of diesel engines when compared to gasoline engines has in the past made it practically impossible to use the conventional type of starting equipment. Starting the Cletrac 80 diesel is as easy as starting the Cletrac 80 gasoline tractor, as electrical equipment of ample capacity is standard on the diesel. Another advantage of electrical equipment of this type is that it permits the installation of lights at a minimum expense.

Wherever possible, the features of the Cletrac 80 gasoline engine have been incorporated in the diesel engine. For example, the underhung crankshaft and the through bolts which pass through the cylinder heads, bloc, crankcase and main bearing caps so that all vertical stresses are transferred from the cylinder heads directly to the crankcase, have been included as features in the Cletrac diesel engine. A Bosch fuel distributing pump and fuel pump are used. The fuel delivery tubes lead from the pump to the nozzles on the left side of the engine.

An Electrode for Welding Cast Iron

AN electrode for welding cast iron by the shielded arc process has been announced by The Lincoln Electric Co., Cleveland, Ohio. This electrode, known as Ferro-weld, simplifies welding procedure on cast iron and also produces a weld of greater strength and ductility than the cast iron itself. This electrode has a steel core surrounded by a heavy flux coating which protects the arc from atmospheric gases injurious to the weld. An advantage claimed for Ferro-weld is the remarkably low heat with which it can be used, thus reducing the possibility of cracking. The electrode is manufactured in only one size, $\frac{1}{8}$ -inch diameter and is used with approximately 80 amperes of current.

The method of using is to weld intermittently, not over a 3-inch bead being laid down at one time. As each bead is

welded it is peened lightly, thoroughly cleaned and allowed to cool somewhat before the next bead is deposited. Due to the extremely low current with which it is used, the hardening effect ordinarily present along the line of fusion is materially reduced, making the weld more machinable.

Sixteen-Yard Motor Trucks

THE exacting conditions prevailing at Boulder Dam and San Gabriel Dam have made necessary the development of construction equipment of unusual size. On these jobs the contractors are making use of the largest dump trucks ever worked, Mack Model AP super-duty trucks made by Mack Trucks, Inc., 25 Broadway, New York City, with bathtub type dump bodies of $14\frac{1}{2}$ and 16 cubic yards capacity. These trucks haul gross loads of 75,000 pounds up grades as steep as 30 per cent in temperatures of as high as 130 degrees. An unusual feature of these trucks is an arrangement whereby the driver can stand on an extended platform with a guard rail at the left of the driver's seat and have perfect control of the truck while backing. This is done by means of an auxiliary throttle and air brake control. Since much of the driving is in reverse and the dump bodies are so high and wide that the driver cannot possibly maneuver the truck from the customary position, this crow's nest is helpful in speeding up the truck.

These trucks have a super-duty rear axle which is heat-treated, of chrome-nickel steel, and is a one-piece drop forging bored out to form a tube, with an outside diameter of 6 inches. The channel frame of these trucks is 8 inches deep, $\frac{5}{16}$ -inch thick and has a 3-inch flange. In addition there is a full channel reinforcement from the rear of the front spring hanger to the front of the jackshaft. This reinforced frame is mounted on huge springs. The rear springs mounted under the axle are 55 inches long and 5 inches wide, each of fourteen leaves having a thickness of $\frac{3}{8}$ -inch. Helper springs mounted above the axle have an effective length of $36\frac{1}{2}$ inches and are 4 inches wide and have ten leaves, $\frac{3}{8}$ -inch thick. These huge trucks are equipped with 40 x 14 dual solid tires, presenting a total width of $4\frac{1}{2}$ feet of rubber tread to the ground.

Four-wheel air brakes, 5 inches wide and 20 inches in diameter, are provided. Both the rear service and hand brake shoes are contained in the same drum side by side and are actuated by separate cams. The total breaking area of 904 square inches is available for service braking since all six of the wheel brakes are actuated in unison by six Westinghouse brake chambers. For hand braking, slotted linkage is provided to operate the secondary brakes on the rear wheels mechanically.

The trucks are powered with a 6-cylinder engine of 5 x 6-inch bore and stroke driving through a heavy-duty transmission having seven speeds forward and two reverse.



Loading One of the 14-Yard Quarry-Body Trucks



Only metal could meet this test
..... that's why it is used



When Auguste Piccard went into the stratosphere, the observation cabin was made of metal. Only metal could resist the tremendous pressure exerted within against the rarified atmosphere. In culverts, it is only metal which can resist the tremendous pressure of freezing water without cracking, crumbling, or disintegration.

Proved by the unerring tester . . .

TIME proves the value of many things. It proves the superior quality of culverts made from GOHI Corrugated Pipe. There are GOHI Culverts which have been in the ground for ten, fifteen, twenty years, and even more, still doing as good a job as when they were new.

TIME

The reason is not hard to find. GOHI Corrugated Pipe is made from GOHI metal — a Pure Iron with the right amount of copper added for maximum resistance to wear, weather, rust, and corrosion.

Consequently, GOHI Corrugated Pipe has the strength to withstand the crushing action of settling fills and the pressure of freezing water; the flexibility to meet the vibration of heavy traffic; the ease of handling and installing that lowers road costs and taxes.



(Meet copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.)

Install culverts which you can forget about for twenty years and more. Get the full facts about GOHI Corrugated Pipe from the fabricator near you.

GOHI CORRUGATED PIPE

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A New Hydraulic Bulldozer

704 A new and simplified hydraulic bulldozer, weighing 1,800 pounds and capable of resisting great strain, designed for use with a Cletrac 35 tractor, is described in literature which the Austin-Western Road Machinery Co., 400 No. Michigan Ave., Chicago, Ill., will be glad to send on request.

A Three-Point Masonry Drill

705 Complete information on the new Rawldrill, the three-point construction of which is claimed to have several advantages, and which are made in sizes $\frac{1}{4}$ to $1\frac{3}{4}$ inches in diameter and also in different lengths, may be secured by interested contractors from the Rawlplug Co., Inc., 98 Lafayette St., New York City.

Tractors and Good Roads

706 Copies of the latest issue of Cletrac Facts, describing and illustrating the need for good secondary roads and the use of Cletrac tractors with grading equipment in making such roads possible at low cost, may be secured by those interested from the Cleveland Tractor Co., Cleveland, Ohio.

An Auxiliary Distributor Unit for Tank Trucks

707 The Trail-O-Distributor which is merely the working end of a Littleford pressure distributor mounted complete on a separate trailer unit and which can be quickly attached to any tank truck for distributing hot or cold bituminous materials on any kind of road work is completely described in literature which may be secured from Littleford Brothers, 485 E. Pearl St., Cincinnati, Ohio.

An All-Steel Portable Truck Scale

708 Gaston Scale Co., Beloit, Wis., will be glad to send to interested contractors literature describing the Gaston all-steel portable truck scale which is designed particularly for highway contractors' use in weighing sand, gravel and other aggregates in truck loads. These scales are furnished in capacities from 10 to 20 tons and in platform sizes from 16 to 20 feet.

Corrugated Steel Sheet Piling

709 YPS-Wemlinger corrugated steel sheet piling which has been in use since 1908 as a practical substitute for wood sheeting and which is made in a plain section with welded clips for temporary use and in a rolled interlock section for permanent installation and is adapted for dam construction, sewer trenches, the protection of bridge footings and hundreds of other services, is described in the literature of The Youngstown Pressed Steel Co., Warren, Ohio.

Concrete Paving Vibrators

710 An economical pneumatically-operated vibrator for concrete paving has been developed by Munsell Concrete Vibrators, 999 West Side Ave., Jersey City, N. J., for compacting low slump concrete in the pavement slab. Complete information may be secured from the manufacturer.

A New Front End Shovel Loader

711 Complete information regarding a new handy tool for the municipal and construction field—a front end shovel loader mounted on a Model M tractor—may be secured from the Allis Chalmers Mfg. Co., Tractor Division, Milwaukee, Wis., or the Frank G. Hough Co., 919 N. Michigan Ave., Chicago, Ill. This unit is equipped with a $1\frac{1}{3}$ -yard bucket for standard work or a larger bucket for handling snow and other light materials.

A Split-Shaft Power Take-Off

712 The new Ditwiler split-shaft power take-off, an improvement on the older Schultze power take-off, is described in a bulletin which may be secured from the Ditwiler Manufacturing Co., Galion, Ohio. This take-off is made in two types: No. 700 is a direct power take-off and is used with equipment mounted on the truck while No. 800 delivers the power at either side of the truck for auxiliary service.

Guard Rail Protection at High Speed

713 Resiliflex road guard, a guard rail unit made in standard panel lengths and post spacings of 16 feet, which has withstood the most severe punishment on highways and race tracks, is described in literature which may be secured from the National Traffic Guard Co., Atlanta, Ga.

A Heavy-Duty High-Head Dredging Pump

714 A new heavy-duty dredging pump built in sizes from 4 to 15 inches discharge and for total heads up to 150 feet for operation by electric motor or belt, with all parts subject to wear built of special wear-resisting materials and with other special features, has been announced by Morris Machine Works, Baldwinville, N. Y., which will be placed to furnish complete information on request.

Corrugated Pipe for All Drainage Purposes

715 Gohi Culvert Manufacturers, Inc., Newport, Ky., will be glad to send to interested contractors and engineers complete information on Gohi corrugated pipe, which is made from Gohi metal, designed for resistance to wear, weather, rust and corrosion. This pipe is suitable for all drainage purposes and is especially adaptable to CWA and similar projects where hand labor is used.

Buckets for Pay-Load Dredging

716 Complete information on the Blaw-Knox dredging bucket, an economical, trouble-free unit which is designed for pay loads and low maintenance performance, may be secured by interested contractors from the Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Penna.

Heavy-Duty Graders

717 The Galion Iron Works & Mfg. Co., Galion, Ohio, will be glad to send to interested contractors complete information on Galion leaning wheel graders, with hydraulic or E-Z lift manual operation, which are designed for heavy-duty performance in building new roads or maintaining existing highways.

A Complete Line of Excavators

718 Bucyrus-Erie Co., South Milwaukee, Wis., will be glad to send to those interested detailed information on its complete line of excavators, including shovels, draglines, dragshovels, skimmer scoops, clamshells, cranes, dredges, tunnel shovels and Bucyrus-Monaghan walking draglines, in sizes from $\frac{1}{2}$ to 20 yards, with all types of power, gasoline, diesel, electric, Gas + Air, diesel-electric or steam.

Driving Piles with Steam Hammers

719 The features of McKiernan-Terry pile hammers for driving wood, concrete and steel sheet piling both in the dry and under water are described in illustrated literature which will be furnished free on request by the McKiernan-Terry Corp., 19 Park Row, New York City.

A Transparent Cure for Concrete

720 Complete information regarding Ritecure, a transparent material sprayed on the concrete to protect it against evaporation during the period of hydration and which does not combine with the concrete surface nor stain or change its physical appearance, may be secured from Johnson-March Corp., 29-28 Hunter Ave., Long Island City, N. Y.

Handling Rocks, Rip Rap or Cribbing

721 The Hayward Co., 32-36 Dey St., New York City, will be glad to send to interested contractors complete information on the Hayward orange peel bucket which is especially adapted to grappling and removing boulders, and handling old rip rap or cribbing.

An Hydraulic Scraper for Tough Digging and Rough Going

722 Complete information on the Sauerman Crescent hydraulic scraper, which is especially designed for heavy dirt moving where the digging is difficult and the going rough, may be secured from Sauerman Bros., Inc., 464 So. Clinton St., Chicago, Ill.

Expansion Joints for Concrete Paving

723 The Philip Carey Co., Dept. E-1, Lockland, Cincinnati, Ohio, will be glad to send to interested contractors and engineers complete information and prices on the Carey Elastite expansion joint, the sandwich joint which protects concrete paving against expansion and contraction stresses.

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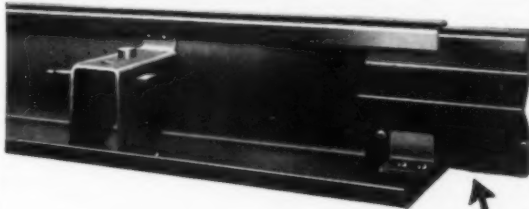
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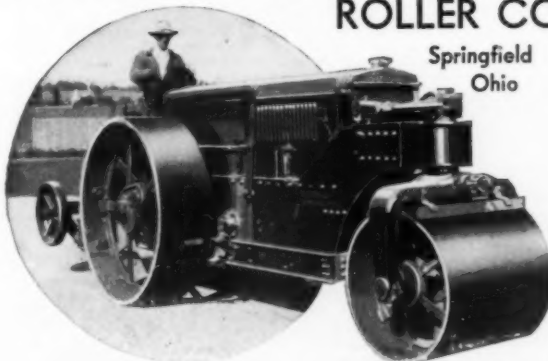
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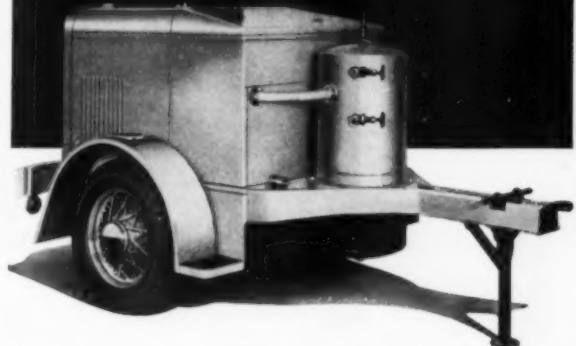
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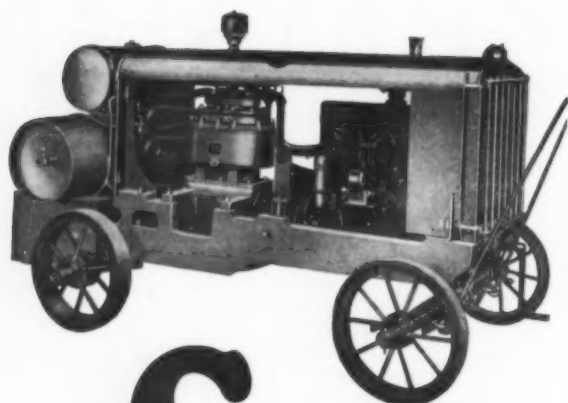
It is a special four-cylinder compressor, V-belt driven by a 4-cylinder engine.

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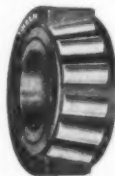
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New Equipment Brings Profits to Progressive Contractors

(Continued from page 46)

A New Portable Trailer-Type Air Compressor

724 Complete information regarding the new Chrysler portable trailer-type air compressor which is quiet, economical and mobile, has a special 4-cylinder compressor which is V belt driven by a 4-cylinder engine and has both compressor intake and delivering valves mechanically operated and a capacity of 156 cubic feet displacement may be secured from Chrysler Motors, Amplex Division, Detroit, Mich.

Heavy-Duty Trucks That Answer Every Hauling Need

725 The GMC heavy-duty line of motor trucks with thirteen basic models covering a 5 to 15-ton range and trailer equipment giving capacities up to 22 tons as well as the line of light and medium duty vehicles from 1½ to 4½ tons capacity covering all the needs of contractors is described in literature which may be secured from the General Motors Truck Co., Pontiac, Mich.

Service and Dependability in Wire Rope

726 Complete information on Williamsport wire rope, features of which are dependability, satisfactory performance and service, and which is made under careful plant operation to insure these features, may be secured by interested contractors from the Williamsport Wire Rope Co., 122 Michigan Ave., Chicago, Ill.

Bituminous Road and Street Equipment

727 Chausse Oil Burner Co., Elkhart, Ind., will be glad to send to interested contractors and engineers complete information on the Chausse line of bituminous road and street equipment, including tar kettles, asphalt plants, maintenance machines, surface and tool heaters and kerosene torches.

Buckets for Every Need

728 Literature describing Williams buckets which are built in power-arm, multiple-rope and dragline types to meet the various needs of the construction industry and which are designed for power and speed, may be secured by interested contractors from the Wellman Engineering Co., 7012 Central Ave., Cleveland, Ohio.

Portable Gravel Equipment

729 The Cedar Rapids Straight Line Tandem Vibrator portable rock and gravel plant with low feeding hopper, large capacity, quick set-up, low overall height, centralized controls, and producing aggregate at low unit costs and made in several types is described in detail in the literature of the Iowa Mfg. Co., Cedar Rapids, Iowa.

Distributors for Oil, Tar and Asphalt

730 E. D. Etnyre & Co., Oregon, Ill., will be glad to send full details on the Etnyre line of distributors for oil, tar and asphalt, features of which are their accuracy of distribution, simple operating mechanism, and low operating and maintenance costs.

8,000-Candlepower from a Portable Light

731 The National Carbide V-G light which spreads a full even beam of about 8,000-candlepower wherever you need it on the job furnishing light for twelve hours on one 7-pound charge of carbide and 7 gallons of water is described in the literature of the National Carbide Sales Corp., Lincoln Bldg., New York City. Other literature describes the V-G handy light, a smaller size delivering 1,500 candlepower and the National Carbide lantern which burns for eight hours.

Installing Dummy Joints

732 Complete information on the Flex-Plaste, a machine for installing dummy joints which has been used by 2,000 contractors in laying more than 15,000 miles of concrete roads, may be secured by interested contractors and engineers from the Flexible Road Joint Machine Co., Warren, Ohio.

Moving Your Construction Equipment

733 Rogers' goose-neck heavy-duty trailers, features of which are the low loading height, lightness and low operating cost in proportion to the load capacity, are described in Catalog No. 28 which Rogers Bros. Co., 108 Orchard St., Albion, Penna., will be glad to send on request.

A Complete Line of Contractors' Pumps

734 Complete information and prices on Jaeger sure-prime pumps, which are built in 2, 3, 4 and 6-inch sizes and are designed for the various pumping needs of the construction industry, may be found in the new catalog which Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio, will be glad to send on request.

Large-Capacity Portable Compressors

735 Curtis portable air compressors, which are designed for hard service, with high efficiency, long life and capacities of 40 to 320 cubic feet, and which are easily started in cold weather, are described in Bulletin C-6-B which the Curtis Pneumatic Machinery Co., 1931 Kienlin Ave., St. Louis, Mo., will be glad to send on request.

A Surfacer for Concrete and Bituminous Pavements

736 The H & H Manufacturing Co., Elvira, Ohio, will be glad to send to interested contractors complete information on the Hill surfacer, a compact unit mounted on roller-bearing pneumatic-tired rear wheels, which removes the bumps in concrete and bituminous pavements and can work at various elevations by means of a vertical adjustment of the axle.

Tackle Your Jobs with Safety Blocks

737 The Peterson quick-opening block which is designed to insure speed and safety and which is made with a steel frame, drop-forged hook and extra large sheaves, is described in literature which William E. Simpson, 100 Morgan Bldg., Detroit, Mich., will be glad to send on request.

Dirt in Your Engine Costs Money

738 Facts about the price you pay for dirt in your engine, dirt that is taken in through the air intake, its effect on oil mileage, on gasoline mileage, and other facts which show that an Air-Maze air filter on gasoline equipment on construction work pays for itself over and over again, may be secured from the Air-Maze Corp., Caxton Bldg., Cleveland, Ohio.

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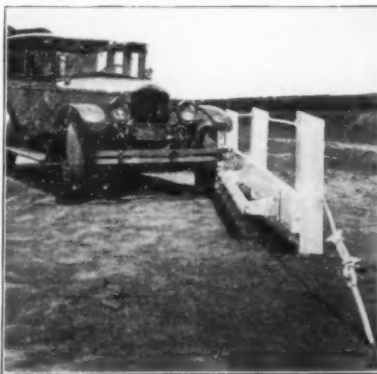
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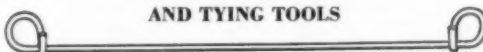
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 Saw Tables and Woodworkers
 Engines and Boilers
 Power Pumps
 Wheelbarrows, Concrete Carts
 Chains, Sprockets, Drives
 Gasoline Engines
 Hoists, Single and Double Drum
 Power Diaphragm & Road Pumps
 Derrick Equipment
 Wire Rope and Accessories
 Steel Torch Lights
 Plain and Fabricated
 Full Line of Industrial Supplies

YANCEY BROTHERS, Inc.

634 Whitehall St., SW Atlanta, Ga.

"CATERPILLAR" Tractors,
 Graders, Power Units, etc.
 REX Paved Mixers, Saw
 Rigs, Road Pumps
 P & H Cranes, Shovels, Drag-
 lines
 BLAW-KNOX Forms, Bins,
 Buckets, Batches etc.
 BARBER-GREENE Ditchers,
 Conveyors, Loaders
 HVASS Asphalt Distributors,
 Sweepers, Sprinklers
 LITTLEFORD Asphalt Tools,
 Kettles
 MUNDT Hoisting Equipment
 BUFFALO - SPRINGFIELD
 Road Rollers
 Member: Associated Equipment Distributors
 INGERSOLL-RAND Air
 Compressors, Tools
 KILLEFER Road Ripper,
 Drag Scrapers
 LAFLANT-CHOATE Crawler
 Dump Wagons, Bulldozers
 MCKIERMAN-TERRY File
 Hammer
 WINSLOW Scales
 CEDAR RAPIDS CRUSHER
 DETACHABLE THURSTON
 Drill Steel and Bits
 BAKER-MANEY Tractor
 Wheelers
 WIARD Road Plows
 EUCLID Wagons, Bulldozers,
 Scrapers
 BALL Wagon Graders

PAUL COCHRAN EQUIPMENT CO.

228 N. LaSalle St. Chicago, Ill.

Representing

Thew Shovel Co.
Universal Crane Co.
Worthington Pump & Machy. Co.
Novo Engine Co.
The Knickerbocker Co.
American Steel & Wire Co.
Fairfield Engineering Co.—Conveyors
R. B. Equipment Co.—Power
Subgraders

Used Equipment—Rentals

Western Contractors Supply Co.*Everything for the Contractor*

14 No. Clinton St. Chicago, Ill.

Representing

DOMESTIC—Pumps, Hoists and Engines
RANSOME—Mixers and Pavers
RED STAR—Wheelbarrows and Shores
INGERSOLL-RAND—Compressors and Tools
WIARD—Contractors Plows

Repairs for Climax,
Waukesha and Le Roi Engines

Member: Associated Equipment Distributors

GIERKE-ROBINSON CO.

4th & Ripley Sts. Davenport, Iowa

Representing

BUCYRUS-ERIE—Cranes, Shovels and Draglines
BLAW-KNOX—Steel Road, Curb and Gutter Forms, Bins,
Batches, Clamshell Buckets, Truck Turntables, etc.
CHAIN BELT—Mixers, Pavers, Pumps, Saw Rigs, Conveyors,
Elevators
CLYDE—Gasoline and Steam Hoists, Derriels
JAEGER—Mixers, Pumps
A. W. FRENCH—Ord. Concrete Road Finishers
SULLIVAN—Air Compressors, Tools
TRACKSON—Crawlers, Shovels and Bulldozers
McCORMICK-DEERING—Industrial Tractors

Member: Associated Equipment Distributors

F. H. BURLEW COMPANY

221-225 West Huron St., Chicago, Ill.

Telephone: SUPERIOR 5804

Representing

BARNES—Pumps
BEEBE BROS.—All-Steel
Hand Hoists
CONTINENTAL—Red Seal
Gas Engines
HELTZEL—Bins, Batches
INGERSOLL-RAND—Air
Compressors and Tools
JONES-SUPERIOR—Porta-
ble Gas & Elec. Saw Rigs
LEACH—Concrete Mixers
and Tower Equipment
McKIERNAN-TERRY CORPORATION
—Divisions—
McKiernan-Terry—Pile Hammers
Lambert-National—Hoists, Cableways
Steels & Condit—Spec. Machinery

PEORIA TRACTOR & EQUIPMENT CO.

400 Franklin Street, Peoria, Illinois

Representing

Caterpillar Tractor Co.
"All-Steel" Products Mfg. Co.
Athey Truss Wheel Co.
Baker Mfg. Co.
Byers Machine Co.
Euclid Road Machinery Co.
Killefer Mfg. Corp.
La Plant-Choate Mfg. Co.
Williamette-Ersted Co.

Telephones—6177-6178

WILSON MACHY. & SUPPLY CO., Inc.*Contractors' Equipment & Supplies*

139-51 North Mill St. Lexington, Ky.

Distributors for

Allis-Chalmers Mfg. Co.
Baker Mfg. Co.
Ingersoll-Rand Co.
Austin-Western Road Machinery Co.
Lakewood Engineering Co.
Thew Shovel Co.
Novo Engine Co.
Construction Machinery Co.
American Steel & Wire Co.
Butler Bin Co.
Foote Company, Inc.
Atlas Powder Co.

"The Contractors' Supply House in Central Ky."

O. T. CHRISTERSON CO.

122 So. Michigan Ave. Chicago, Ill.

Representing

KOEHRING COMPANY—Mixers, Pavers, Cranes, Shovels
Dumpers, Mud Jacks
KWIK-MIX COMPANY—Bituminous Mixers
BLAW-KNOX COMPANY—Forms, Ord Finishers, Bins,
Batches, Buckets, Truck Mixers
C. H. & E. MFG. CO.—Pumps, Saw Rigs, Hoists
INSLEY MFG. COMPANY—Concrete Towers, Chuting,
Cranes, Shovels
PARSONS COMPANY—Trench Machines, Turbo Mixers
LE ROI COMPANY—Air Compressors
LITTLEFORD BROS.—Distributors, Tar Kettles, Heaters,
Torches
CLEVELAND FORMGRADER CO.—Graders, Scrapers,
Rotators, Form Graders, Straight Edges, Finishing Tools
CENTAUR TRACTOR CORP.—Mowers, Tractors
Wheelbarrow Scales—Burlap—Tie Bars—
Hose—Concrete Carts

BOWMAN-RALSTON TRACTOR & EQUIPMENT CO.

401 E. Florida St. Evansville, Ind.

Representing

Caterpillar Tractor Co.—Road Machinery and
Harvester Machinery
Athey Truss Wheel Co.
LaPlant-Choate Mfg. Co.
Baker Manufacturing Co.
Thew Shovel Company
Killefer Manufacturing Co.
Schramm, Inc.—Compressors
Williamette-Ersted Co.—Hoists
Pioneer Gravel Equip. Mfg. Co.
Anthony Company

THOMAS L. BARRET*Contractors' Equipment*

112-114 So. Second St., Louisville, Kentucky
C. H. & E. Pumps and Contractors Equipment
WILLIAMS Clam Shell and Drag Line Buckets
HAISS Loader and Material Handling Equipment
ARMSTRONG Blast Hole Drills
UNION Hammers and Concrete Buckets
HUG Trucks, Turntables and Subgraders
MUNDY Hoisting Engines
VULCAN Locomotives
METAFORM Road Rails, Wall Forms, etc.
"CAMEL" Automatic Tractor Dump Wagon
KENNEDY Gearless Crushers
CORRUGATED Bar and Mesh Reinforcement
BARRET Asphalt Expansion Joint
RUSSELL Scrapers, Drags, etc.
BAY CITY Shovels and Cranes
LaCROSSE "Tu-Way" Trailers

SUPERIOR CONSTR. EQUIP. CO.*Construction Equipment*

1850 South Kostner Ave., Chicago, Ill.

Distributors

Chain Belt Co. Rogers Bros. Corp.
The Huber Mfg. Co. Heitzel Steel Form & Iron Co.
Portable Machinery Co. Freeman Manufacturing Co.
O. K. Clutch & Machy. Co. Byers Machine Co.
Nat'l Highway Marker Co. Moritz-Bennett Corp.
Le Roi Company

National Distributors for the "Banty" Roller and Trailer
A Complete Line of Construction Tools and
Equipment Carried in Chicago

TELEPHONE: CRAWFORD 6200

Member: Associated Equipment Distributors

Standard Equipment & Supply Corp.*Successor to*

McLaughlin Mill Supply Co., Inc.

534 Michigan Ave. Hammond, Ind.

Representing

JAEGER Plaster, Mortar and
Concrete Mixers, Pumps,
Hoists, Lakerods, Towers
and Mast Plants
MARION—Steam Shovels
and Cranes
GOULD—Pumps
CYCLONE—Fence
LEROI—Engines
BATES—Tractors
CASE—Industrial Tractors

All Kinds of Used Equipment

Brandeis Machinery & Supply Co.

201 Warnock St. Louisville, Ky.

Representing

J. D. Adams Co. Ingersoll-Rand Co.
Aerol Burner Co., Inc. Insley Mfg. Co.
Barber-Greene Co. Internat'l Harvester Co.
Blaw-Knox Co. A. Leschen & Sons Rope Co.
Bucyrus-Erie Co. McKiernan-Terry Corp.
Buffalo-Springfield Roller Co. M & M Wire Clamp Company
Cameron Steam Pump Works National Equip. Corp.
Chicago Wheelbarrow Scale Co. Quick Way Truck Supply Co.
Cleaver Bros. Co. Sagen Derrick Co.
Clyde Sales Company Sauerman Bros.
The Deming Company Smith Engineering Works
E. I. DuPont de Nemours & Co. Sterling Machinery Corp.
A. B. Farquhar Co. Waukesha Motor Co.
Western Wheeler Scaper Co.

Member: Associated Equipment Distributors

LOOK THIS DIRECTORY OVER CAREFULLY

If you find any errors while checking over this directory will you please advise us at once, because it is our desire to keep it accurate and up-to-date at all times.

CONTRACTORS AND ENGINEERS MONTHLY

470 Fourth Ave.

New York

INDIANA EQUIPMENT CO., INC.

327-29 West Market St. Indianapolis, Ind.

Representing

ATHEY TRUSS—Wagons, Bulldozers
BUFFALO-SPRINGFIELD—Rollers
"CATERPILLAR"—Road Machinery
"CATERPILLAR"—Tractors
EUCLID—Wagons, Scrapers, Bulldozers
GENERAL—Shovels and Cranes
INGERSOLL-RAND—Compressors, Tools
LaPLANT-CHOATE—Wagons, Scrapers, Bulldozers
LIMA—Shovels and Cranes
NIAGARA—Vibrating Screens
OWEN—Clam Shell Buckets
OMAHA—Dragline Buckets
PAGE—Dragline Buckets
SAUERMAN—Cableways, Power Scrapers
UNIVERSAL—Crushers, Pulverizers

ROY C. WHAYNE SUPPLY CO.

Cor. 8th & Main Sts. Louisville, Ky.

Representing

Caterpillar Tractor Co.
Jaeger Machine Co.
Heitzel Steel Form & Iron Co.
Barnes Manufacturing Co.
Davey Compressor Co.
Hardsocg Wonder Drill Co.
Chicago Automatic Conveyor Co.
Northwest Engineering Co.
Euclid Crane & Hoist Co.
Athey Truss Wheel Co.
LaPlant-Choate Mfg. Co.
Good Roads Machinery Corp.
New Holland Machine Co.
Timken Roller Bearing Co.—
Rock Bits

Joe C. Tucker

Morganfield

Kentucky

Representing

Austin-Western Rd. Machy. Co.
Cleveland Tractor Co.
Western Wheeler Scraper Co.
Harnischfeger Corporation
Lakewood Engineering Co.
A. B. Farquhar, Ltd.
Chain Belt Co.
Link-Belt Co.
Sullivan Machy. Co.
Butler Bln Co.
Euclid Rd. Machy. Co.
Hughes-Keenan Co.

Louisiana Road Machinery Co., Inc.

1111 Julia Street

New Orleans, La.

Representing

GALION IRON WKS. & MFG. CO.—Graders, Rollers, Motor Patrols, etc.
CLEVELAND TRACTOR CO.—Tractors
ELGIN CORP.—Street Sweepers and Eductors
EAGLE TRUCK BODY & MFG. CORP. — Dump Wagons
UNIVERSAL CRUSHER CO.—Rock Crushers
STROUD ROAD MACHINERY CO.—Elevating Graders

D. C. ELPHINSTONE, INC.

115 S. Calvert St.

Baltimore, Md.

Representing

Koehring Co.
T. L. Smith Co.
Kwik-Mix Co.
Indley Mfg. Co.
Parsons Co.
C. H. & E. Mfg. Co.
Geo. Halse Mfg. Co.
Sawman Bros. Inc.
Allis-Chalmers Mfg. Co.
Beaumont Birch Co.
Gardner-Denver Co.
Linn Mfg. Corp.
Owen Bucket Co.
LaBour Co., Inc.
Emerson Pump & Valve Co.
Iowa Mfg. Co.
H. K. Porter Co.
Road Prentice Corp.
Truscon Steel Co.
McKiernan-Terry Corp.
Lambert-National Hoists
Goodall Rubber Co.
Milwax Co.
E. D. Elyre & Co.

Member: Associated Equipment Distributors

HENRY A. PETTER SUPPLY CO.

Paducah

Kentucky

Alenite Equipment
American Wire Rope, Mesh
Bates Bar Ties
Beebe Hand Hoists
Black & Decker Tools
Cedar Rapids Crushers
Chain Belt (Res) Mixers
D-A Lubricants
DuPont Explosives
Dobbie Derricks
Elastic Expansion Joint
Farquhar Engines, Boilers
Gulf States Reinforcing Steel
Hansen Excavators
Hauk Heaters and Thawers
Johnson Bins and Hoppers
Lidgerwood Hoisting Machy.
Lincoln Electric Motors
Link-Belt Portable Conveyors
LeRoi Gas Engines
Northwest Shovels, Cranes
Novo Pumps and Hoists
Oxweld Apparatus
Page Buckets
Rogers Bros. Trailers
Sagen Derricks
Shook Grader Blades
Toledo Torches
Trackson Tractors
Universal Conc. Accessories
Vulcan Pile Equip.
Wehr Graders
Western Road Machinery
Worthington Pumps
Wyoming Shovels

SOUTHERN STATES EQUIP. CO., Inc.

1510-30 Tchoupitoulas St.

New Orleans

Representing

NORTHWEST—Shovels, Cranes and Draglines
BLAW-KNOX—Bins, Batches, Road Forms, Buckets
ORD—Concrete Finishing Machines
FOOTE—Paving Mixers
JAEGER—Concrete Mixers, Pumps
BUFFALO-SPRINGFIELD—Road Rollers
DOMESTIC—Pumps, Engines
ORR & SEMBOWER—Hoisting Engines
LAKEWOOD—Concrete Chuting
THOR—Compressors and Air Tools
TELSMITH—Sand and Gravel Plants
KOPPEL—Industrial Cars and Trucks
CHICAGO—Automatic Material Conveyors
CLEVELAND—Subgrader Scrapers, Form Scrapers
IOWA—Pre-Mix Plants, Crushers
HAISS—Automatic Material Conveyors
HILL—Surfacers, Finishers

JOHN C. LOUIS COMPANY

511 W. Pratt St.

Baltimore, Md.

Representing

JAEGER—Concrete Mixers, Pumps, Truck Mixers, etc.
LAKEWOOD—Finishers, Forms, Towers
AMERICAN CABLE—Tru-Lay Wire Rope
NORTHWEST—Cranes, Shovels, Draglines
BUTLER—Bins
CENTAUR—Road Mowers
WORTHINGTON — Compressors, Drills, etc.
FOOTE—Pavers
ADAMS — Leaning Wheel Graders
WHEELING — Corrugated Culvert Pipe
GOOD ROADS—Crushers, etc.
LITTLEFORD — Asphalt Heater Distributors
HOTCHKISS—Forms
BURCH—Spreaders
JONES—Saw Rigs
GENERAL—Wheelbarrows
WHITING—Rustoid

Member: Associated Equipment Distributors

EASTON TRACTOR AND EQUIPMENT COMPANY

Lee & Harris Sts. Alexandria, La.

Tallulah, La.

Representing

CATERPILLAR TRACTOR CO.—"Caterpillar" Tractors and Road Machinery
SPEEDER MACHINERY CO. — Cranes, Shovels and Draglines
ATLAS SCRAFER CO.—Rotary Scrapers
WILLAMETTE-ERSTED CO.—Tractor Hoists
KILLFERE MFG. CORP.—Farm Tools
BRODERICK & BASCOM WIRE ROPE CO.—Rope
BLAW-KNOX CO.—Atco Scrapers
LA PLANT-CHOATE MFG. CO.—Wagons and Scrapers
Also
A complete line of Tractor Farming Implements and Tractor Appliances

NORTHERN ROAD EQUIPMENT CO.

82 St. John Street

Portland, Maine

Representing

ALLIS-CHALMERS MFG. CO.—Tractors
BAY CITY SHOVELS, INC.—Shovels, Crane
IOWA MANUFACTURING CO.—Crushers, Gravel Plants
DOMESTIC ENGINE & PUMP CO.—Pumps
FOUR WHEEL DRIVE AUTO CO.—"FWD" Trucks
INTERNATIONAL HARVESTER CO.—Industrial Tractors
N. P. NELSON IRON WORKS—Loaders
SCHRAMM, INC.—Air Compressors and Tools
TRACKSON CO.—Hoists, Loaders
WEHR CO.—Power Road Graders

THE HENRY H. MEYER CO.

110 S. Howard St., Baltimore, Md.

628 Munsey Building, Washington, D. C.

Representing

Blaw-Knox Co.
Boston & Lockport Block Co.
Byers Machine Co.
Philip Carey Co.
Chausse Oil Burner Co.
Connerly & Co., Inc.
Domestic Engine & Pump Co.
Dobbie Foundry & Machine Co.
Duff-Norton Mfg. Co.
Galion Iron Wks. & Mfg. Co.
A. B. Farquhar Co., Ltd.
Harrington Co.
Ingersoll-Rand Co.
A. Leschen & Sons Rope Co.
Lidgerwood Mfg. Co.
Piers Equip. Co.
Pulomator Steam Pump Co.
Ransome Concrete Machy. Co.
Richmond Screw Anchor Co.
Sterling Wheelbarrow Co.
Templeton-Kenly Co., Ltd.
Union Iron Works
Universal Road Machy. Co.
Member: Associated Equipment Distributors

FLETCHER EQUIP. CO., INC.

309 Magazine St. New Orleans, La.

Representing

ARCHER Towers and Chuting Equipment
BARBER-GREENE Loaders, Conveyors, Ditchers
BUTLER Bins, Batches
CLYDE Hoisting Engines and Derricks
FREEMAN Turntables
GALION Graders, Rollers
LE ROI-RIX Portable Air Compressors
LE ROI Gas Engines
LINK-BELT Draglines, Cranes and Shovels
M & M Form Clamps
OWEN Clamshell Buckets
OMAHA Dragline Buckets
REX Mixers, Pavers, Pumps and Saw Rigs
RUSSCO Oil Distributors
SAUERMAN Cableway Excavators
STERLING Wheelbarrows and Carts
SIMPLEX Trench Braces and Jacks
TOLEDO Torches
WOOD Molybdenum Stook Shovels

Member: Associated Equipment Distributors

ALBAN TRACTOR COMPANY, Inc.

725-27 East 25th St.

Baltimore, Md.

Representing

CATERPILLAR TRACTOR CO.
"CATERPILLAR" ROAD MACHINERY
"CATERPILLAR" COMBINE HARVESTERS
GENERAL EXCAVATORS
KILLFERE TILLAGE TOOLS
LINK-BELT SHOVELS & CRANES
EUCLID ROAD MACHINERY CO.
CLEVELAND ROCK DRILL CO.
BARNES MFG. COMPANY
LA PLANT-CHOATE MFG. CO.
WILLAMETTE-ERSTED CO.
BAKCOCK MFG. CO.
BAKER MANUFACTURING CO.
ROTARY SNOW PLOW CO.
ATHEY TRUSS WHEEL CO.
REX-WATSON CORPORATION
"JAY BEE" FEED MILLS
DAVEY AIR COMPRESSOR CO.
BLAW-KNOX BULLDOZERS, DIRTMOVERS

THE BOND co.

Harold L. Bond, Pres.

39 Old Colony Avenue

South Boston

Mass.

Contractors' Tools and Equipment

Representing

SMITH—Mixers and Pavers
KOEHRING—Cranes, Shovels and Mixers
PARSONS — Trench Machines and Backfillers
INSLEY—Excavators and Concrete Placing Equip.
CHICAGO—Auto. Conveyors
ROGERS—Trailers
HAUCK—Keroseene Heaters
CONNERLY & CO.—Asphalt Kettles
SASGEN—Derricks
JOHNSON Bins and Batches
NOVO — Gasoline Engines, Pumps and Hoists
INGERSOLL-RAND — Air Compressors

Member: Associated Equipment Distributors

EQUITABLE EQUIPMENT CO., Inc.

410 Camp Street

New Orleans, La.

BROWNING Cranes, Shovels
AUSTIN Trenching Machines
BOX Cranes and Hoists
CUMMINGS Diesel Engines
CEMENT GUN CO. Gunite
CLIMAX Engines
DEAN BROS. Pumps
ENGBERG Generating Units
ERIE Aggremeter Bins
HYDROL Oil Purifiers
GENERAL ELECTRIC Air Warden Motors
INGERSOLL-RAND Air Compressors, Tools
INTERNATIONAL Nickel, Meneel Metal
KOPPEL Industrial Cars
LARSEN Steel Sheet Piles
MOORE Turbines
MUNDY Hoists
MURRELL Pipe Machines
MORRIS Dredges, Pumps
NOVO Engines, Hoists, Pumps
PANGBORN Sand Blasts
PLYMOUTH Locomotives
ROPER Pumps
STEPHENS-ADAMSON Conveyors, etc.
SILENT Hoists, Cranes
T. L. SMITH CO. Mixers
WEIR-KILBY Frog Switches
Welded Pipe, Tanks, Barges

THOS. M. BROWN, INC.

106 So. Gay St.

Baltimore, Md.

Representing

KEYSTONE—Shovels and Well Drills
KNICKERBOCKER—Concrete, Plaster & Mortar Mixers
LE ROI—Rix Air Compressors
NOVO—Hoists
ERIE—Clamshell & Dragline Buckets, Aggregators & Plants
M & M—Form Clamps and Shores
TOLEDO—Torches
WOOD—Shovels
MARLOW—Pumps
NORTHERN—Conveyors

CLARK-WILCOX COMPANY

790-798 Albany St.

Boston, Mass.

Representing

RANSOME—Concrete Mixers, Chuting Equip.
NORTHWEST—Cranes, Shovels, Draglines
BLAW-KNOX—Steel Forms, Bins, Buckets
ORD—Concrete Road Finishers
CARTER—"Humdinger" Pumps
INGERSOLL-RAND—Air Compressors
ORB-SEMBOWER—Hoists, Boilers, Mixers
BOOS—Shores and Clamps
HAUCK—Oil Burners and Heaters
HAISS—Elevators, Conveyors and Loaders
ALLIS-CHALMERS—Tractors
BAKER—Bulldozers
SARGENT—Flows
EBERLE BROS.—Hoists
CLEVELAND—Formgraders
C. E. JAHN CO.—Trailers

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Crushers,

Asphalt

barrows

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Pump Co.

Machinery

Ltd.

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CO.

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Heaters

Asphalt

Batchers

Engines,

— Air

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Mass.

Equip.

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THE EQUIPMENT CO.

8 Gerard St. Boston, Mass.

Representing

LINK-BELT Cranes and Shovels

INGERSOLL-RAND Compressors and Tools

CONTINENTAL "Red Seal" Gas Engines

HEDGE & MATTHEIS COMPANY

285 DORCHESTER AVE. BOSTON, MASS.

Albany, Buffalo, N. Y.; Providence, R. I.; Portland, Me.; New Haven, Conn.; Springfield, Worcester, Mass.

American Tubular Elevator Co. Littleford Bros.
Austin Machinery Corp. McKiernan-Terry Corp.
Brookville Locomotive Co. Lambert-Nat'l Hoisting Div.
Jones Superior Mach. Co. Mead-Morrison Mfg. Co.
Erie Steel Construction Co. Cons. Const. Machy. Corp.
Red Star Corp. Sagen Derrick Co.
Hercules Motors Corp. The Ohio Power Shovel Co.
Homelite Corporation Toledo Pressed Steel Co.
Ingersoll-Rand Co. Wehr Co.
Jaeger Machine Co. Wood Shovel & Tool Co.
Lakewood Engineering Co. Ladel Conv. & Mfg. Co.
Dobbie Fdy. & Mach. Co. W. A. Riddell Co.
LaRoi Company Universal Rd. Machy. Co.
A. Lechen & Sons Rope Co. Tinsken Roller-Bearing Service and Sales Co.

Member: Associated Equipment Distributors

THOMAS G. ABRAMS

Construction Equipment

2411 Fourteenth St. Detroit, Mich.

Representing

Aeroll Burner Co.
Archer Iron Works
Brookville Locomotive Co.
(McCormick-Deering Power)
Butler Bin Company
Burch Corporation
LeBel-Bix Compressors
St. Regis Paper Company
Sagen Derrick Company
T. L. Smith Company
Sterling Wheelbarrow Co.
Toledo Pressed Steel Co.

CYRIL J. BURKE

Great Lakes Terminal Warehouse
DETROIT MICHIGAN

Representing

Lakewood Engineering Co.
Jaeger Machine Co.
Dobbie Foundry & Machine Co.
Hercules Motors Corp.
Erie Steel Construction Co.
Easton Car & Construction Co.
J. D. Farasey Mfg. Co.
J. S. Mundy Hoisting Engine Co.
J. M. Willard Co.
Upson-Walton Co.
A. S. Marlow Co.
Whitcomb Locomotive Co.

Keller Tractor & Equipment Co., Inc.

5163-69 Martin Avenue

Detroit Distributors of Michigan

Ateco—Dirt-moving equipment and bulldozers
Baker Mfg. Co.—Snow plows, road machinery
Blaw-Knox Company—Finishing machines, road forms, bins, batchers and buckets
Bucyrus-Erie Company—Shovels, cranes, draglines
Chain Belt Co.—Mixers, Pavers, Pumps
Caterpillar Tractor Co.—Tractors, graders, road machinery
Domestic Engine & Pump Co.—Hoists, pumps
D-A Lubricant Co.—Lubricants
Dittler Mfg. Co.—Hercules Spreaders
Gardner-Denver Co.—Air Compressors and tools
Killefer Mfg. Corp.—Road and farm tools
LaPlant-Choate Mfg. Co.—Bulldozers, backfillers, wagons, snow plows
A. Lechen & Sons Rope Co.—Wire rope
Pioneer Gravel Eq. Mfg. Co.—Gravel Equipment
E. D. Etnyre & Co.—Oil and Tar Distributors and Heaters

R. G. MOELLER COMPANY

14415 Meyers Rd. Detroit, Mich.

Representing

American—Tubular Towers
Barnes—Pumps
General—Wheelbarrows, Concrete Carts
Ingersoll-Rand—Compressors, Air Tools
Knickerbocker—Concrete Mixers, Saw Rigs
Lackawana—Steel Sheet Piling
Sagen—Derricks and Winches
American Steel & Wire—Wire Rope
Wood—Shovels, Picks and Maule
Orava—Bottom Dump Buckets
Trilok—Steel Grating
American Marsh—Redi-Prime Pumps
Homestead Valve—High Pressure Jenny

E. K. S. EQUIPMENT CO.

18 Grandville Ave., S. W. Grand Rapids, Mich.

Representing

ALLIS-CHALMERS—Tractors, graders, wagons, Power Units
BERG—Concrete Finishers
CLEVELAND—Air Tools
DIAMOND—Crushers, Gravel Plants, Washing Equipment
FLEXIBLE—Road Joint Machinery
FOUR WHEEL DRIVE—Trucks
HELTZEL—Forms, Bins, Batcher
HUBER—Rollers
KOEHRING—Shovels, Cranes
INSLEY—Towers, ½-yd. Shovels
KWIK-MIX—Mixers
LITTLEFORD—Kettles, Heaters, Asphalt Machinery, Distributors
MATTSON—Snow Fence
MACWHYTE—Wire Rope
NOVO—Engines, Pumps, Hoists
PARSONS—Trenchers, Backfillers
SCHRAMM—Air Compressors, Tools
SHOVELS, PICKS and SMALL TOOLS

Pingry Tractor & Equipment Co.

1239 Buchanan Ave. Grand Rapids, Mich.

Representing

CATERPILLAR—Tractors, Road Machinery, Combines
LA PLANT - CHOATE—Bulldozers, Trailers, Backfillers, Wagons
KILLEFER—Road Rippers
EUCALID—Automatic Scrapers, Wagons
PIONEER—Gravel Screening, Crushing and Washington Equipment
WAUSAU—Snow Plows, Tractor Equipment
AMERICAN HOIST & DERRICK CO.—Gas Shovels, Cranes and Draglines

BORCHERT-INGERSOLL, INC.

St. Paul, Minn. Duluth, Minn.

American Tubular Towers
Ball Wagon Graders
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Lakewood—Tower Equip.
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The volume of Public Works Construction is being felt. New stimulation of private industry and the utilities is now under consideration. The Construction Industry can well look ahead to definitely improved conditions.

Do You Know the PRICE of DIRT?

How do you pay for the dirt that enters your engine? The dirt itself is free ... all too free ... for it comes in with the air that enters your carburetor and is passed along with the gasoline mixture into the engine.

What does the dirt cost you after it gets in the engine? Untold expense. The most glaring cost is in carbon removal, for the dust and dirt sucked into the engine is the chief cause of hard carbon formations. Burned bearings and scored cylinders are caused in most cases because the engine has been operating with dirt laden air.

Does dirt affect oil mileage? You bet it does. That's the main reason why you have to change oil ... it gets loaded down with dust, dirt and grit. And most of that contaminating material is taken directly into the engine with the gas mixture. Keep dirt out of your engine and you automatically keep it out of your oil.

Does dirt affect gasoline mileage? Yes it does. If the air is heavily laden with dust and dirt you do not get that proper carburetion and proper vaporization of the gasoline which is the basis of all engine performance.

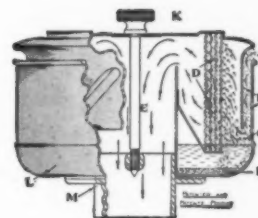
How much dirt do you get? You have no idea how much dirt, dust, grit and grime passes into your engine every day. For every single gallon of gasoline you use, 8,400 gallons of air go through

your carburetor. And every ounce of that air carries dirt in suspension. If you doubt it, just look at your windshield. And remember that the same dust and dirt you collect on your windshield is going into your engine, to work havoc with its finely adjusted parts and minute clearances.

What does dirt do inside the engine? It combines with the oil and changes oil into a grinding compound. Since dirt is largely silicon it aids in carbon formation, especially the hard silicon carbon that is the hardest of all carbon to remove.

How can dirt be kept out of the engine? Just put on an Air-Maze. It's attached to the carburetor inlet in a jiffy. And it does the trick ... completely. There's no air cleaner like an Air-Maze. The leading automotive engineers will confirm that statement. It causes the dirt to impinge on the mesh screening but it does not resist the free flow of the incoming air nor impede the engine performance in any way. Actual tests have repeatedly shown a higher horsepower output after the Air-Maze was attached.

Does it pay for itself? Many times over. You can count on a minimum saving of a cent a mile. Large truck operators have proven repeatedly that their Air-Maze equipped cars and trucks reduce operating and maintenance costs by a cent or more a mile. Let us give you all the facts. A letter will bring them... write it now!



OIL BATH TYPE

THE dust laden air enters on all sides of the unit in a large but relatively thin vane at A. An induced spiral and rolling motion forces a large part of the grit and dust to deposit on the oiled surfaces of inner and outer cases at B. Additional dust is washed out when the air comes in contact with the turbulent oil bath at C. The semi clean air is then thoroughly filtered while passing through the twelve layer AIR-MAZE patented filter element D which is kept washed clean and reoiled by the splash of the agitated oil bath. The clean air proceeds to the motor at E while the dust is washed downward into the sump at F.

AIR-MAZE CORPORATION, Caxton Building, Cleveland, Ohio

AIR-MAZE

The Completely Protective Air Filter for All Automotive Equipment

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